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Introduction

In the last two decades economies of the former communist countries experienced two important historical events. After the fall of Communism in the late 1980s and early 1990s, former communist countries went through the transition process with the objective of turning their socialist centrally planned economies based on state ownership into a market-driven system with private ownership of production resources. The second event was the accession of Central and East European Countries (CEECs) to the European Union (EU). This process led to a further strengthening of market institutions in CEECs and at the same time led to the introduction of EU polices in New Eastern EU Member States (NEMS).

The agricultural sector played a prominent role in these two historical events. In terms of agricultural production and agricultural employment, the agricultural sector in many transition countries is more important than in Western Europe and North America. Agriculture is therefore viewed as a much more important factor for economic growth. Consequently transition within the agricultural sector significantly affected the overall economy as well as living standards of a large share of the region's population. These factors also significantly affected EU accession negotiations. Agriculture represented one of the most difficult issues in the negotiations over enlargement. This was further complicated by the fact that agriculture was, and continues today to absorb almost half of the EU budget. There were concerns that the integration of the large agricultural sectors of CEECs would cause significant changes in the EU's budgetary expenditure and have large market implications.

There is a growing literature on agricultural transition and agricultural accession. An important issue analyzed in the transition literature is the impact of land reform and privatization on the development of farm structures. Initially, the literature predicted that large socialist cooperative farms would give way to individual farms, and farm structures in transition countries would converge to the farm types observed in Western Europe, USA or in other developed countries. However, later literature acknowledged that many institutional impediments which reforms failed to remove helped to preserve features of the farm structure inherited from Communism. Large farms still dominate in many transition countries. In general the evidence shows that the reforms and the emergence of individual farms had a positive impact on agricultural productivity. At the same time, the empirical evidence on the relative efficiency of individual farms and large commercial farms is inconclusive.

The main issues analyzed in the accession literature was production, trade, budgetary and income effects of the EU accession of CEECs. The evidence is mixed, but in general (especially early) literature predicted large market effects and large budgetary costs of accession. The literature predicted a large increase in production, trade, agricultural support and incomes after accession of CEECs. These effects were in most cases predicted to be driven by the introduction of Common Agricultural Policy (CAP) of EU in NEMS.

The objective of this study is to improve our understanding of income distribution effects of polices in general and also applied to the case of CEECs' EU accession and subsequent adoption of CAP. In the same time the objective is to understand the welfare effects of land reforms in transition countries. The contribution of this study to the literature is the incorporation of land market and credit market imperfections into the analysis on welfare effects of polices and of land reforms implemented during transition.

The analysis is theoretical, focusing on four major issues concerning the welfare distribution effects of subsidies and of land reforms implemented during transition. In particular, this study focuses on: (i) the modeling of transaction costs and imperfect competition and their impact on land markets in transition countries; (ii) the analysis of how land market imperfections and credit market imperfections affect welfare effects of area subsidies; and (iii) the efficiency and welfare effects of reforms in the land markets in transition countries.

In the first chapter of this thesis, a partial equilibrium model of the land market is developed to analyze how transaction costs and imperfect competition affect land markets in CEECs. The chapter shows that the combination of imperfect competition and transaction costs have substantial impact on the functioning of land markets in transition countries. Markets imperfections result in depressed land market rents and provide an advantage to large corporate farms by creating extra benefits to them. Landowners lose because of low land rental price. Individual farms may gain or loose from market imperfections. They gain from imperfect competition, while they loose from transaction costs.

The second chapter of this thesis uses the model developed in the first chapter to analyze the income and efficiency effects of the implementation of CAP subsidies in CEECs. Eastern enlargement of the EU led to integration of the agricultural economies of the NEMS in the CAP. As a consequence, farmers in the NEMS receive area payments for the land they use, gradually increasing over a transition period. In well-functioning land markets, such payments typically get incorporated in land values and thereby benefit mainly landowners and lead to increases in input costs for farmers. The second chapter shows that, as long as there is competition from individual farms, domination of the land market by corporate farms and transaction costs do not affect the result that CAP subsidies will end up as increases in land prices and benefit landowners instead of farmers. In the last part of the chapter, it is shown that the 2003 CAP reform has both positive and negative efficiency effects in NEMS.

While distortions are reduced and policy rents are shifted to farmers, restructuring of the farms is blocked. Mitigating this effect through reserve entitlements causes a reduction in subsidy benefits for farmers as land prices increase.

The third chapter departs to some extent from the second chapter by using a general model of agriculture to analyze distributional effects of area payments. The model introduces credit market imperfections. The aim is to analyze how credit market imperfections alter the results obtained in chapter two. The chapter shows that imperfections in credit markets may lead to very different outcomes. When farms are credit constrained, the introduction of area payments will lead to even larger gains for landowners as land rents will increase by more than the subsidy. The effect of an area payment on farm surplus is negative as farmers gain directly from the subsidy and indirectly from the increase in productivity. However, they lose from the increase in land rents. The land rent increase is larger than their gains, causing a negative net impact. If farms are heterogeneous, the most credit constrained farms (ex ante) and those which are most effective in using the subsidies for the reduction of their credit constraints may gain.

The forth chapter of this thesis analyzes the efficiency and welfare effects of partial reforms which reduce transaction costs but which maintain imperfect competition in the land market. In several transition countries large corporate farms continue to dominate the land market. For example, they use more than 80% of land in countries such as Belarus, Slovakia, and Russia and more than 50 % in the Czech Republic, Bulgaria, Kazakhstan, and Ukraine. This chapter shows that the efficiency gains from transaction cost reductions are mitigated, and can even be offset due to the lack of competition.

CHAPTER 1. A Model of Transaction Costs and Imperfect Competition in Land Markets[1]

1.1. Introduction

In 1989 the Berlin wall, a symbol of Communism, fell, leading to the collapse of Communist regimes in Central and Eastern European Countries (CEECs). During the subsequent transition period, the CEECs turned their socialist, centrally planned economies based on state ownership into market-driven system with private ownership of production resources.

The structure of socialist agriculture was strongly biased towards extremely large farms. Average farm size ranged from around 1 200 hectares in Poland to around 19 000 hectares in Bulgaria. This size was very large compared to average farm size in market economies such as the European Union or USA.

Through the privatization process private property rights to land were restored. In most CEECs land was restituted to former owners. Hungary and Romania combined the distribution of land to agricultural workers with the restitution to former owners (Lerman, Csaki, and Feder, 2004; Swinnen, 1999)

The land reform process has created a class of new, sometimes absentee, land owners while land is used by a mixture of smaller individual farms and large-scale corporate farms.

These corporate farms are mostly successor organizations from the former collective and state farms after farm privatization and land reform. In CEECs they are, on average, between 300 and 1200 hectares, and their share of land use is around 90% in Slovakia, 75% in the Czech Republic, 50% in Bulgaria, 40% in Hungary, and more than 30% in Romania and Estonia.[2] Moreover, in most countries they use a more than proportionate share of the best agricultural areas of the country.

Large scale corporate farms continue to use large parts of the land due to a variety of reasons. However, an important reason is that historically, the large-scale farms were the users of the land. New owners of the land face significant transaction costs if they want to withdraw their land from the farms and reallocate it. Transaction costs include bargaining with the farm management, obtaining information on land and tenure regulations, implementing the delineation of the land and dealing with inheritance and co-owners (Mathijs and Swinnen, 1998; Prosterman and Rolfes, 1999; Ciaian, 2001).

The domination of large corporate farms also leads to imperfect competition in the land market. The combination of imperfect competition and transaction costs has a strong impact on land prices. For example, Vranken and Swinnen (2003) find that in Hungary land prices are lower in regions where corporate farms dominate. In several CEECs there is a large gap in rental prices between land used by corporate farms and land used by individual farms. Table 1.2 shows how in the Czech Republic and Slovakia land rents paid by corporate farms are generally much lower: most vary between 60% and 20% of the rents paid by family farms. Further, corporate farms also reduce payments by paying in kind instead of in cash. A study by IME (2000) found that in Bulgaria, corporate farms generally paid their rents in kind, while family farms were much more likely to pay cash or mixed cash/in-kind.

The objective of this chapter is to develop a partial equilibrium model of the land

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[1] This chapter is based on the paper of Ciaian and Swinnen (2006)

market of transition countries to analyze how transaction costs and imperfect competition affect the development of land markets in CEECs. This model will be used in chapters two to analyze the income and efficiency effects of the implementation of CAP area subsidies in CEECs, and in chapter four to analyze the efficiency and welfare effects of reforms.

The analysis in this chapter is related to the literature on transaction costs which can be traced back to Coase (1937) who applied it to the theory of firm. After Coase, Oliver Williamson was the key contributor to the development of transaction cost economics. Williamson focused on the problem of vertical integration and combined the organization theory approach with the economic theory of the firm. According to Williamson, the key determinants of transaction costs are frequency, specificity, uncertainty, limited rationality, and opportunistic behavior. Williamson defines transaction costs as the work that individuals or organizations have to put in terms of effort, time and various expenses in order to obtain relevant information with which negotiate contracts, to the process of bargaining and enforcement of contracts (Williamson, 1985). Transaction cost economics was used to study a variety of economic phenomena such as transaction cost of market exchange (e.g. Baumol, 1952; Tobin, 1956; Demsetz, 1968), governance structure dealing with various ways of organizing transactions (e.g. Williamson e.g., 1967, 1971, 1973, and 1975), and the measurement and agency problem (e.g. Alchian and Demsetz, 1972; Jensen and Meckling, 1976; Barzel, 1982).

There are many applications of transaction cost theory to agricultural land markets. The most important fields can be grouped into three categories: namely (*i*) agency problems associated with labor, credit and insurance market imperfections (e.g. Binswanger and Rosenzweig, 1986; Barham, Bouncer, and Carter, 1996; Allen and Lueck, 1998; Deininger and Feder, 1998), (*ii*) rental contract choice focusing on transaction cost economics of

[2] Based on national statistical sources (see also table 1.1).

sharecropping, fixed wage and fixed rent contracts (e.g. Cheung, 1969; Eswaran and Kotwal, 1985; Taslim, 1992; Barzel, 1997; Ray, 1999; Swinnen and Vranken, 2004), and (*iii*) formal and informal institutions such as land property rights, land reform, land law, norms, etc. (e.g. Deininger, 1999; de Janvry and Sadoulet, 1989; Prosterman and Rolfes, 1999; Swinnen, 1999; Platteau, 2000). This thesis is closely related to the third group of studies particularly focusing on transaction costs associated with land reforms implemented in transition countries.

1.2. The Model

Before transition, effective land rights in CEECs were in the hands of the state, or the collective farms. Land was used by large-scale state and collective farms.[3] Land reform in the early 1990s reallocated most land property rights to individual households in CEECs. We will refer to them as "*landowners*". Land reform took several forms. The main form in CEECs was restitution of land to former owners (Lerman, 2001; Swinnen, 1999; Ciaian and Pokrivcak 2007).

More or less simultaneous with land reform, important farm restructuring took place. Farm restructuring included a privatization of the farms and a restructuring of the management structure. This restructuring included a reorganization of collective and state farms into private cooperatives and farming companies. We will refer to them as "*corporate farms*", which are typically large-scale. The most dramatic restructuring was the break-up of collective and state farms into household plots and family farms. We will refer to these as "*individual farms*".

To keep the analysis tractable we will model these developments in a stylized way.

[3] The exceptions to this rule were Poland and the countries of former Yugoslavia, where land use and ownership remained in small private farms during the Communist system.

First, consider a situation where all the land is now owned by individual households, but still used by the corporate farms. (This reflects a situation where the land reform is formally completed, and the farms have been privatized, but no restructuring to individual farms has occurred.)

Second, we assume that land transactions take place exclusively through rental agreements. This is consistent with the majority of land transactions in CEECs (Research Institute of Agricultural Economics; Statistical Office of the Slovak Republic; Swinnen and Vranken, 2004; VUZE, 2001). Including both sales and rental transactions would seriously complicate the analysis without yielding much additional insights for most of the analysis. Landowners receive a rent *r* for each unit of land that they rent to corporate farms.

Several households, landowners or not, consider starting up an individual farm for which they need land. They can either withdraw land from corporate farms or rent from landowners who currently rent their land to corporate farms. In both cases the price they have to pay per unit of land is the sum of the rent paid by the corporate farms, *r*, (explicitly for rented land or implicitly as opportunity costs) and the transaction costs, *t*, involved in withdrawing the land from the corporate farms.

1.3. Transaction Costs

Transaction costs in land exchange can be very substantial in CEECs.[4] When a landowner wants to withdraw land from the CF there are several reasons why transaction costs may arise in this process. These include: bargaining costs, costs of enforcing right of withdrawal, and costs related to asymmetric information, co-ownership, unclear boundary definition and costs

[4] This thesis focuses on land transaction costs resulted from farm collectivisation during Communism and subsequent land reforms implemented during transition period. As a result, the analyses apply only to countries where collectivisation took place. In countries such as Poland collectivization took place only in some regions and thus the analysis concerns only these regions.

related to unknown owners. First, while the withdrawal procedure is usually stipulated by law, it is also determined by the willingness of the CF to implement it (Mathijs and Swinnen, 1998). For example, in Slovakia the CF has the right to give a plot of land to owners located in a different place than the one specified in the ownership title (based on former boundaries) if the plot affects the integrity of the CF's land operation. The landowner gets only usage right to this new plot while s/he keeps the ownership right to the original plot located in former boundaries. This asymmetry obviously increases the costs for the landowner, since s/he can be deterred from withdrawal by being offered a plot located far from his operation or the plot may be of lower soil quality. The laws in Bulgaria, Slovenia and Hungary contained similar transaction cost increasing features (see Bojnec and Swinnen, 1997; Ciaian, 2001; Mathijs, 1997; Prosterman and Rolfes, 1999; Swain, 1999).

Second, CF managers typically have more information than landowners about the economic situation of farm and about regulations governing local land transactions.[5] This is especially the case for landowners who have not been involved in agriculture, or are living outside the village where their land is located, or are pensioners (Swain, 1999).[6]

Third, other transaction costs follow from co-ownership of land, unclear boundary definition, and the problem of unknown owners. In many CEECs, land was never formally nationalized during the Communist regime, although effective property rights on land were controlled by the regime and the collective farms. Hence, legal ownership of land remained private (Swinnen, 1999). However, land ownership registrations were poorly maintained, if at all, and in many areas land consolidation was implemented, wiping out old boundaries and relocating natural identification points (such as old roads and small rivers). The loss of

[5] For example, Swain (1999) describes how pensioner-members of co-operatives in Slovakia were “forced” to rent the land to the co-operative by being threatened of losing their pension.

[6] In Hungary "passive owners" (this include village-based pensioners, landowners that are not active in the co-operatives and those living outside of the village where their land is located) received around 71% of agricultural land (Swain, 1999).

information on registration and boundaries produced a large number of unknown owners in some transition countries (Dale and Baldwin 1999). In addition, unsettled land inheritance within families during the socialist regime caused a strong land ownership fragmentation and a large number of co-owners per a plot of land. For example, according to OECD (1997), in 1993 approximately 9.6 million plots were registered in Slovakia, which is 0.45 hectares per plot, and each plot was owned by on average 12 to 15 people. As Dale and Baldwin (1999) put it, "a single field of twenty hectares may have hundreds of co-owners". In the Czech Republic, there were 4 million ownership papers registered in 1998 for 13 million parcels, with an average parcel size of 0.4 hectares. In Bulgaria, a recent study found that 50% of the plots were co-owned, often by several people (Vranken, Noev, and Swinnen, 2004). The average number of co-owners was more than two (excluding husband and wife co-ownership). Some co-owners may be unknown, or may not be in the country, or may be scattered all over the country. This raises the costs of land withdrawal as land withdrawal from the CF normally requires agreement from co-owners. The study indeed finds that co-owned plots of land in Bulgaria are more likely to be used by corporate farms.

Finally, other costs related to land transfers include notary fees, taxes and other administrative charges. For instance, the studies on Bulgaria, Lithuania and Romania, estimate these costs between 10% and 30% of the value of the land transaction (OECD, 2000; Prosterman and Rolfes, 1999).

To model these transaction costs, we need to distinguish between transaction costs which are specific to the plot, to the owner, and to the user. Transaction costs will depend on the distribution of land among households and farms, on individual characteristics of landowners, and on the fragmentation of the land. To reduce these dimensions we assume that initially all plots of one owner are used by one corporate farm.[7] Define G^j as the transaction costs specific to the relationship between owner j and the corporate farm. These costs can be due to asymmetric information and bargaining. Define as the g^{ij} transaction costs specific to plot *i* of owner *j*. Transaction costs may differ per plot due to the number of co-owners or boundary uncertainty.

We can now derive the transaction costs per unit of land, t^{ij}, as a function of these plot- and owner-specific transaction costs:

$$(1) \quad t^{ij} = \frac{g^{ij}}{a^{ij}} + \frac{G^j}{A^j}$$

where and a^{ij} and A^j are, respectively, the size of plot *i* and total land owned by owner *j* with $A^j = \sum_i a^{ij}$.

First, it follows from (1) that fragmentation of land ownership increases the per unit transaction costs. This is reflected in the first term of equation (1). Ceteris paribus, with fragmentation the plot size will be smaller and hence the transaction costs per plot higher. This increases transaction costs per unit of land: $\partial t^{ij} / \partial a^{ij} < 0$ with A^j fixed.[8]

Second, when land ownership is distributed unequally among households, transaction costs increase with the amount of land withdrawn from corporate farms. The reason is that part of the transaction costs G^j are fixed per owner. Hence, ceteris paribus, larger owners will have lower per unit land transaction costs, and will be withdrawing land first. Smaller

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[7] This assumption is realistic giving the regional organization of the CFs and also consistent with the further modeling approach using one representative CF.

[8] Note that we assumed that $\partial g^{ij} / \partial a^{ij} = 0$. If this is not the case then $\frac{\partial t^{ij}}{\partial a^{ij}} = \frac{1}{a^{ij}} \frac{\partial g^{ij}}{\partial a^{ij}} - \frac{g^{ij}}{\left(a^{ij}\right)^2}$ and the sign of $\partial t^{ij} / \partial a^{ij}$ depends on the sign an the size of $\partial g^{ij} / \partial a^{ij}$. The sign of $\partial g^{ij} / \partial a^{ij}$ could be negative or positive. The larger the plot the more likely that the plot has access to a road which decreases the negotiation costs. In this case $\partial t^{ij} / \partial a^{ij} < 0$. On the other hand, g^{ij} can increase with plot size; for example because the

owners of land have larger transaction costs per unit of land and hence the premium that IF have to pay to access the land of small land owners will need to be larger.

Third, transaction costs per unit of land will be constant if land ownership is distributed equally ($A^j = A$ for all *j*) and homogenously (the plot size distribution is the same for all landowners), and if landowners and plots do not vary in other characteristics. In this case $g^{ij} = g$, $G^J = G$ and $a^{ij} = a$ for all *i* and *j*, and per unit transaction costs, *t*, are constant:

$$(2) \quad t = \frac{g}{a} + \frac{G}{na}$$

where n is the number of plots per landowner. Fragmentation affects the level of *t* but not the distribution.

In reality, land ownership is fragmented and relatively egalitarian in the CEECs. The egalitarian distribution is due to a combination of factors (Swinnen, 1997). In many CEECs the Communist regimes immediately after World War II, and prior to collectivization, implemented radical land reforms, taking away land from large land owners, religious institutions and groups that had supported the pro-Nazi regime, distributing it among small tenants, landless people, and pro-communist groups. In other countries, further egalitarian land reforms were implemented during collectivization; and in yet other regions, more in southern Europe, the Ottoman empire had left a very egalitarian land ownership structure. Land restitution restored, and in fact reinforced, these egalitarian land distributions. In those countries where restitution was not widely implemented (Slovenia and Poland) or mixed with

number of neighboring owners may increase which complicates the negotiations over access to a road and boundary definitions. In this case the sign of $\partial g^{ij} / \partial a^{ij}$ is undetermined.

other land reform procedures (Hungary and Romania), land ownership is also relatively equally distributed.[9]

This implies that fixed transaction costs per unit could be a reasonable approximation of reality in many regions of the CEECs. However, a more general specification is used in the analysis and mathematical derivations allowing for both fixed and (monotonically) increasing transaction costs. To reduce the complexity of the graphs, only fixed per unit transaction costs are used to construct the figures. The derivations will show that almost none of the results are affected by whether transaction costs are fixed or increasing per unit of land.

1.4. The Equilibrium with Perfect Competition

The land decision-making problem of a profit-maximizing individual farm (IF) is then:

(3) Max $\prod^I = pf^I(A^I) - (r+t)A^I$

where p is output price, A^I is amount of land rented by the IF, $f^I(.)$ is production function for which $\frac{\partial f^I(A^I)}{\partial A^I} > 0$ and $\frac{\partial^2 f^I(A^I)}{\partial A^{I^2}} < 0$. The first order condition for optimal land use is:

(4) $p\frac{\partial f^I(A^I)}{\partial A^I} = (r+t)$.

The optimal level of land rented is where the marginal value product of land, represented by the left hand side of (4), equals the IF's marginal cost of land, $r + t$. The marginal cost is the rental rate an IF has to pay to a landowner, and which equals the corporate farm rental rate (r) plus the transaction costs per unit of land (t). Condition (4) defines the demand for land of the individual farm. Aggregating this over all (potential) IFs yields the total demand for land by individual farms, D^I. Total IF demand for land is represented in figure 1.1 by D^I for zero

[9] Hungary and Romania combined the distribution of land to agricultural workers with the restitution to former owners. This contributed to the land ownership fragmentation because the size of land owned by large former landowners was reduced and allocated to farm workers.

transaction costs (t=0) and D_{t1}^I and D_{t2}^I for transaction costs, t_1 and t_2, respectively,[10] with $t_2 > t_1 > 0$. The horizontal axis in figure 1.1 represents the amount of land, with $A^I = A^T - A^C$. The vertical axis measures land rental price.

For reasons of exposition, consider first that corporate farms are also price takers in the land market (we will relax this assumption soon). In this case the CF demand for land is represented by D^C. When there are no transaction costs the equilibrium in the land market is at (A^*, r^*). The land used by the CF equals A^* and the land used by the IF is $A^T - A^*$.

With transaction costs, the equilibrium is at (A_{t1}^*, r_{t1}^*) and (A_{t2}^*, r_{t2}^*) for transaction costs t_1 and t_2, respectively. It is obvious from figure 1.1 that with increasing transaction costs, the share of land used by corporate farms is higher and the rent they pay is lower. Transaction costs allow CF to use more land and at lower costs. Their gains are equal to area A for transaction costs t_2.

Only the CF benefit from these reduced rents. The land rental price for IFs is the CF price plus the transaction costs. The land rental price for IFs *increases* with increasing transaction costs: from r^* to $r_{t1}^* + t_1$ and $r_{t2}^* + t_2$, for transaction costs t_1 and t_2, respectively. The losses of IFs are equal to area DE for transaction costs t_2. Landowners also lose because their income from land rents declines: without transaction costs they receive r^* per unit of land; with transaction costs t_2 they only get r_{t2}^* (which equals the rental rate of corporate farms and the net per unit payments from IFs after covering transaction costs). Their losses are equal to area ABC for transaction costs t_2. The net aggregate welfare losses with t_2 are equal to area CE, measuring the total transaction costs and area DB, measuring the deadweight costs of the induced economic distortions.

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[10] (The inverse) aggregate IF land demand is a function of land renting A^I, i.e. $D^I(A^I)$. This follows from equation (4) with t=0. The more land IF rents, the smaller rent it is willing to pay. Horizontal aggregation of all IF demands determines the aggregate IF land demand. To simplify the text, aggregate IF land demand is denoted as D^I. Aggregate IF land demand with transaction costs t is defined as $D_t^I = D^I - t$.

1.5. Imperfect Competition

In several CEECs corporate farms may not be price takers in the land rental market. For example, in countries such as Slovakia where they occupy around 90% of the land, corporate farms are likely to have important market power. To model this, assume that there is one corporate farm, CF, which recognizes that its land rental decisions will influence the land rental price. The CF is not a monopolist since there is a group of (potential) individual farms who are price takers in the rental market. The IFs will rent land up to the point where their demand equals their rental price (ie. $r+t$). The CF will take the reactions of the IFs to changes in the land rental price into account: it will adjust its land renting to maximize profit subject to the behavior of the IFs.

In this situation, the objective function of the corporate farm is the following:

(5) $$\text{Max } \Pi^C = pf^C(A^C) - r(A^C)A^C$$

where Π^C are CF profits, A^C is amount of land rented by the CF, $r(A^C)$ represents the rental rate as a function of A^C, with $\frac{\partial r}{\partial A^C} > 0$. $f^C(.)$ is the CF's production function for which $\frac{\partial f^C}{\partial A^C} > 0$ and $\frac{\partial^2 f^C}{\partial A^{C^2}} < 0$.

The first order condition is as follows:

(6) $$p\frac{\partial f^C}{\partial A^C} = r + A^M \frac{\partial r}{\partial A^C}$$

where A^M is the optimal land allocation of the CF.

The left hand side of condition (6) represents the marginal benefits, i.e. the marginal value product of land, and the right hand side is the marginal cost of land for the CF. The marginal cost of land includes both the rental rate and changes in the rental rate when the CF rents in more or less land. The corporate farm will take into account increases in the price of land when it rents more land. It will choose its land use where the marginal cost of land renting equals the marginal benefits. Graphically, this can be represented as in figure 1.2. For simplicity, we assume for a moment that there are no transaction costs (t = 0). MC^C represents the marginal cost function of land renting for the CF.[11] The equilibrium land use by the corporate farm is where MC^C equals D^C, ie at A^M. The resulting CF rental price is r^M.

Compared to the competitive market equilibrium (A^*, r^*), the domination of the market by the CF leads to a reduction of land use by the CF ($A^M < A^*$), and a corresponding increase of land use by the individual farms. The land rental price is lower for all farms ($r^M < r^*$). The surplus gains of the CF are area $A – C$ (>0). The IFs also gain, by area *EGL*. The losses are for the landowners who lose rental income equal to area *ADEGL*. The effect on rural households depends to what extent they are employed by the CF, or are IFs, or landowner. For rural households who are both landowner and individual farmer, the losses in rental income may outweigh the gains in farm profits from lower rental prices. Finally, the total welfare effects are negative. Social costs due to the market power of the CF equals area *CD*.

Figure 1.2 also shows the situation of imperfect competition with transaction costs t. In this case, the equilibrium is at (A_t^M, r_t^M). The CF rental price falls further to $r_t^M < r^M < r^*$: both the transaction costs and the market power of CF push the CF rental price down. Compared to the competitive market equilibrium with transaction costs (A_t^*, r_t^*), the domination of the market by the CF leads to a reduction of land use by the CF ($A_t^M < A_t^*$), and a corresponding increase of land use by the individual farms.

The combination of imperfect competition and transaction costs results in extra

[11] The shape of the marginal cost function is basically determined by the elasticity of individual farmers land demand. Since the total land demand is fixed, when the CF rents an additional hectare of land, it must pay a higher rent, the one that IF are willing to offer (the first term on right hand side of the equation (6)), plus the

benefits for the CF. Relative to the competitive equilibrium without transaction costs (A^*, r^*), the surplus gains of the CF equals area *ABDE*. Landowners lose twice as both factors put a downward pressure on rental prices. Their combined loss equals area *ABDEGHLN*. For individual farms the two market imperfections have opposite effects. IFs gain from lower rental prices and more land with imperfect competition, but lose from higher rental prices and less land with transaction costs. The net effect depends on the relative size of the transaction costs. With low transaction costs, the benefits from CF market power will dominate. With high transaction costs (as is the case in figure 1.2), the losses due to transaction cost will dominate. The net loss for IFs is equal to area *FK*.[12] The total welfare effects are negative. Compared to the competitive market equilibrium (A^*, r^*), (A_t^M, r_t^M) implies losses equivalent to – *KLN* –*FGH*, where *KLN* represents the total transaction costs incurred and *FGH* the market distortions.

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increase of rent for every hectare of land rented (the second term on the right hand side of equation (6)). The more inelastic the IF land demand is, the higher is this increase in rent and consequently the steeper the MC^C is.

[12] Notice that if transaction costs would be such that the marginal cost function MC_t^C would go through point (A^*, r^*) that both effects would exactly offset each other and the combined impact on IF welfare would be zero.

1.6. Conclusions

This chapter developed a partial equilibrium model of the land market in transition countries. Specifically, the chapter analyzed the impact of transaction costs and imperfect competition on the development of land markets in CEECs. The combination of imperfect competition and transaction costs result in depressed land market rents and provide an advantage to CF by creating extra benefits to them. Landowners lose because of low land rental price. IF may gain or loose from market imperfections. They gain from imperfect competition, while IF loose from transaction costs. Overall impact on IF profits depends on which effect is stronger.[13]

[13] Chapter four shows in more detail how both market imperfections affect IF profits.

CHAPTER 2. EU Accession[14]

2.1. Introduction

In 2004 eight CEECs, which 15 years ago were still under tight Communist rule, joined the EU. Additionally, Bulgaria and Romania joined in 2007. Agricultural issues have played a prominent role in the enlargement debate. Crucial issues were whether a reform of the Common Agricultural Policy (CAP) was needed to avoid conflicts with budgetary and WTO constraints when the CAP would be extended to CEECs and whether CEEC farmers would get access to the same subsidies as farmers in the EU-15 (Hartell and Swinnen 2000; Tangermann and Banse, 2000). In fact, the final days before this historic event were spent mostly on intense negotiations on agricultural subsidies and production quotas.

Several studies contributed to the debate by quantitatively estimating the impact of EU enlargement in agriculture on EU expenditures, protection levels, commodity markets, trade and WTO (e.g. Banse, Münch, and Tangermann, 2000; Ciaian, Pokrivcak, and Bartova 2005; Frohberg et al. 1998; Hertel, Brockmeier, and Swaminathan, 1997; Münch, 2002; Weber, 2000).

Two important shortcomings of these studies are that they generally ignore the presence of imperfections in factor markets and that the studies pay relatively little attention to the income distribution effects within the CEEC economies. The latter is a major weakness since much of the policy debate centered on how the implementation of the CAP would affect rural incomes in CEECs (European Commission, 2002b; NIAE, 2004).

The absence of factor market imperfections is also an important shortcoming, since rural factor markets in CEECs are characterized by major imperfections, due to the transition process and more general rural development problems (Bezemer, 2003; Dries and Swinnen 2002; World Bank, 2001). In particular, with respect to CAP payments per unit of land – which make up a large share of the CAP subsidies in the new EU member states (NEMS) – imperfections of the land markets are crucial since they may have a significant impact on both the efficiency and distributional effects of these payments. Several studies document that land markets in the NEMS function imperfectly as land sales are constrained, as important transaction costs in the land markets prevent efficiency enhancing land exchanges, and as large farm corporations use their monopoly power in local or regional land markets (Dale and Baldwin, 1999; Lerman, Csaki, and Feder, 2004; World Bank, 1999). We focus in particular on transaction costs and imperfect competition.

The objective of this chapter is to analyze explicitly how these land market imperfections affect the welfare effects of introducing the CAP in the CEECs, or as of the date of accession, the NEMS. The partial equilibrium model of the land market developed in the first chapter is used to analyze how the income and efficiency effects of the implementation of CAP area payments are affected by transaction costs and imperfect competition in the land market in the NEMS.

The analysis – and the impact of EU accession – is complicated by the reform of the CAP which was agreed in 2003 by the EU Council of Ministers. This reform will have a significant impact on the mechanism of CAP support in the future in the NEMS, and in the

[14] This chapter is based on the paper of Ciaian and Swinnen (2006).

last part of the chapter the effects of the introduction of this policy reform are analyzed.

2.2. Impact of Area Payments

Since the 1992 MacSharry reform and the Agenda 2000 reforms, the vast majority of CAP subsidies are so-called direct payments (DPs). In 2006, 34.8 billion euro was spent in the EU-15 on direct payments alone. They make up around two-thirds of the CAP budget and include both per hectare payments for some commodities and payments per animal for some livestock activities. They formed one of the most hotly disputed issue in the EU enlargement negotiations, as the NEMS insisted on getting full access to DPs, while EU-15 member states only wanted to give partial DPs. The ultimate agreement, reached in Copenhagen in 2002, allowed for DPs to be partially introduced from the date of accession and then gradually increased, from maximum 55% in 2004 to 100% in 2010.[15]

Define s as the subsidy (area payment) per unit of land, and assume that all land in the analysis qualifies for the subsidies. The objective function of the IF then changes to

(7) $$\Pi^I = pf^I(A^I) - (r + t - s)A^I .$$

The subsidy s shifts the value marginal product of land curve by s:

(8) $$p\frac{\partial f^I(A^I)}{\partial A^I} = r + t - s .$$

The objective function for the CF changes as well.

Proposition 1: *Area payments benefit only landowners, with and without transaction costs and perfect competition in the land market.*

[15] The EU budget only pays for 25% in 2004 and gradually increases this amount to reach 100% in 2013. However, NEMS governments are allowed to add subsidies from their own budget (the so-called “top-ups”) to a combined maximum of 55% in 2004, gradually increasing to 100% by 2010. Also, NEMS have an option to combine the total direct payments envelope and grant it per hectare bases, instead of granting it separately per animal or per hectare for crop commodities.

Proof: see Appendix A1.

Figure 2.1 shows the first part of the result. Without transaction costs and with perfect competition in the land market, the IF and CF land demand function with subsidies are D_s^I and D_s^C, respectively, and the equilibrium shifts from (A^*, r^*) to (A_s^*, r_s^*). Notice that the land allocation does not change: $A^* = A_s^*$. Furthermore, the surplus of neither CF nor IF is affected. Their incomes remain unaffected by the subsidy. All the gains go to the landowners. The total gains for landowners are equal to the area *B*, which is equal to the total subsidies $sA^T = (r_s^* - r^*)A^T$.

This result holds in general. With transaction costs and imperfect competition in the land market, all the benefits of subsidies still go to landowners. Figure 2.2. shows the general case. The subsidy shifts the marginal cost function from MC_t^C to MC_{ts}^C. With transaction costs *t* and imperfect competition, the subsidy causes the equilibrium to shift from (A_t^M, r_t^M) to $(\mathrm{A_{ts}}^\mathrm{M}, \mathrm{r_{ts}}^\mathrm{M})$. The land allocation does not change: $A_t^M = \mathrm{A_{ts}}^\mathrm{M}$. Rental prices increase from r_t^M to $\mathrm{r_{ts}}^\mathrm{M}$ for corporate farms and from r_t^M+t to $\mathrm{r_{ts}}^\mathrm{M}+t$ for individual farms. The difference between both rental prices is exactly the size of the subsidy ($\mathrm{s} = \mathrm{r_{ts}}^\mathrm{M} - r_t^M$). As a result the subsidies get fully captured by land price increases and the surplus of neither CF nor IF is affected. All the gains go to the landowners, equal to the sum of areas *F* + *G*, which equals the subsidy per unit of land times the total amount of land used ($\mathrm{sA}^\mathrm{T} = (\mathrm{r_{ts}}^\mathrm{M} - r_t^M)A^T$).

2.3. Unequal Access to Subsidies

An important assumption behind these results is that both corporate farms and individual farms get the same subsidies per hectare. In reality this assumption may not be correct. Access to the payments may be complicated for small individual farmers because of administrative constraints in applying for the subsidies and problems in satisfying additional requirements.[16] If so, some of the individual farms may not get access to the payments.

Proposition 2 : *With unequal subsidies, area payments benefit landowners and CF, while IF lose on average*.

Proof: see Appendix A2.

To analyze the effect of this, assume that only part of the individual farms get area payments. This will result in a smaller shift of the aggregate IF land demand function than would be if all would get the subsidy *s*. Define s^I as the "equivalent subsidy", i.e. the subsidy which would cause the same shift in the land demand function if all individual farmers would get the same subsidy s^I. Figure 2.3 illustrates this situation. For simplicity, we start from figure 2.1 where we assumed no transaction costs and perfect competition. The result of unequal subsidies is that the new demand curve D_u^I is below the D_s^{I} curve, while the CF demand is still represented by D_s^C. The new equilibrium is now at (A_u^*, r_u^*). Notice that the land allocation changes now: A_u^* is to the right of $A^* = A_s^*$. Corporate farms use more land and individual farms use less.

Total subsidies allocated equal area *ABCD*E (to CFs) and F (to IFs). A large part of the subsidies still end up with landowners through an increase in land rental prices, equal to area *BCEFG*. Individual farmers lose out because the land rental price increases more than the subsidies they get: $r_u^* - r^* > s^I$. Their losses equal area *EG*. Corporate farms gain because the increase in rental prices is lower than the subsidies they receive: $r_u^* - r^* < s$. Their gains equal area *A*. As subsidies now induce distortions in the allocation of land, there are deadweight costs, equal to area *D* and *E*. Obviously, the relative sizes of these effects depend

[16] A typical requirement is so-called "cross-compliance", which means that, among others, farms need to fulfil some agri-environmental conditions in order to obtain the subsidies. These conditions for example may require farmers to meet certain obligations regarding fertilisers, pesticides and seeds use, food safety, landscape quality, etc.. Another problematic requirement for IF may be minimum farm size criteria. In countries such as Bulgaria, Estonia, Hungary Lithuania and Romania the average IF farm size is between 1 and 4 hectares (table 1.1).

on the elasticity of the demand curves and on the difference in the subsidies.

Similar conclusions follow when including transaction costs and market imperfections. This is illustrated in figure 2.4. We start from figure 2.2 where transaction costs, market imperfections and equal access to subsidies were assumed. For unequal subsidies the new marginal costs function, MC_u^C, along which the CF decides on the quantity of land rented, is below the MC_{ts}^C. This leads to a new equilibrium (A_u^M, r_u^M). The land allocation changes. Corporate farms use more land ($A_u^M > A_t^M = A_{ts}^M$) and individual farmers less. Total subsidies allocated in the equilibrium equal area *ABDE*. A substantial part of the subsidies still go to landowners through increased rental prices, equal to area *BDEF*. Individual farmers lose, while corporate farms gain. The losses to individual farmers equal area *DF* and the gains to corporate farms equal area *AC*. Because the CF uses its market power, it rents less land than socially desirable (see figure 1.2). However, unequal subsidies make it profitable for the CF to use more land. This leads to a land allocation that is closer to the perfect competition equilibrium. However, if the difference in subsidies obtained by the CF and IF is sufficiently large, the CF could even use more land than the equilibrium with perfect competition.

2.4. Impact of the 2003 CAP Reform

In 2003 the EU decided to decouple CAP subsidies starting from 2005. This means, in terms of our model, that subsidies will be given as a fixed set of payments per farm, so-called single farm payments (SFP). The SFP for a specific farm equals the support the farm received in the previous "reference" period. The SFP is an entitlement, but future SFP payments depend on the farm operating an amount of "eligible hectares" equivalent to the size of the entitlement.

Specifically, define E^C as the total payment for the corporate farm after CAP reform, and $A_E{}^C$ as the amount of eligible area for payments. Assuming that E^C equals the total subsidies the corporate farm received with the area payment system, and that all the land it used qualifies as eligible land, we have $E^C = A_E{}^C \,.\, s$, which is equal to area F, with $A_E{}^C = A_t{}^M$ in figure 2.2. Making similar assumptions for the individual farms, $E^I = A_E{}^I \,.\, s$, where $A_E{}^I = A^T - A_t{}^M$, which equals area G in figure 2.2. Hence, payments per eligible hectare, e, are equal in this case: $e = e^C = e^I$.

The policy reform has important impacts on the distribution of policy rents. The first implication is that policy rents shift from landowners to farms with the new CAP support system.

Proposition 3 : *Decoupled single farm payments benefit only farms, with and without land market imperfections.*

The corporate farm and individual farmers are not granted payments for the land that they rent above the eligible area, $A_E{}^C$ and $A_E{}^I$ respectively. Consider first the case when the IFs want to rent more land, $A^I > A_E{}^I$. Since the total land supply is fixed, it implies that the CF would then rent less land than its eligible area, $A^C < A_E{}^C$. In this case the respective land demand functions are determined by:

(9) $pf_A^I = r + t(A^I)$

(10) $pf_A^C + e = r + A^C \dfrac{\partial r}{\partial A^C}$

For the extra land (area $A^I - A_E{}^I > 0$), IFs cannot pay more than the marginal production value of the land. In contrast the CF is willing to pay a higher rent, up to e more.

Secondly, consider the case when land rented by IFs is less than the eligible area, $A^I < A_E{}^I$ and $A^C > A_E{}^C$. The demand functions are then defined by:

(11) $pf_A^I + e = r + t(A^I)$

(12) $pf_A^C = r + A^C \dfrac{\partial r}{\partial A^C}$.

In this case the reverse logic holds. The payments increase the IF land demand. The rent that IF is willing to pay is increased by *e*.

Equations (9) and (11) for IF and equations (10) and (12) for CF imply kinked land demand functions with the SFP. Consider figure 2.2 again. Starting in the left hand side of the figure and following the thick lines, IF demand is given by $D_t^I\ D_{ts}^I$ while CF demand is given by $D_s^C\ D^C$. The CF marginal cost function is also kinked. For the land area $A_E^I = \mathrm{A}^\mathrm{T} - A_t^M$ or lower, the CF marginal cost function is given by thick line MC_{ts}^C. For $A^I > \mathrm{A}^\mathrm{T} - A_t^M = A_E^I$, the CF marginal cost is represented by thick line MC_t^C. At A_t^M the demands and CF marginal costs are represented by thick vertical lines.

The equilibrium with SFP is (A_t^M, r_t^M). Compared to the area payments, the land allocation is the same $A_t^M = \mathrm{A}_{\mathrm{ts}}^\mathrm{M}$, but the rental price is lower: the rent will decline from $\mathrm{r}_{\mathrm{ts}}^\mathrm{M}$ to r_t^M. When the CF rents marginally more land than A_t^M, it is willing to pay only r_t^M (determined by $D^C = MC_t^C$). Similarly, when IF wants to rent marginally more than $\mathrm{A}^\mathrm{T} - A_t^M$, the rent that IF is willing to pay is r_t^M (given by D_t^I). The equilibrium land rent will be r_t^M. Farmers gain all the subsidies, equal to area *FG*. The gains to the corporate farm equal area *F* and the gains to individual farms equal area *G*.

However, this result is conditional upon how potential new entrants in farming are treated. With support now linked to current farms, new farmers (who are potentially more dynamic and productive and therefore a source of growth) are excluded from benefiting from the support system. These problems appear particularly problematic in the NEMS where major farm restructuring continues to take place, and is required to stimulate the productivity of the farm sector. To address some of these concerns, it was decided to create a ‘reserve’ to grant subsidy entitlements to new entrants. It turns out that these reserve entitlements can have an important impact on the total distribution of policy rents.

Proposition 4 : *Benefits of SFP will shift to landowners when new entrants are eligible for SFP entitlements, with and without land market imperfections*.

Proof: The proof of this proposition is similar to the proof of proposition 1. When new entrants are eligible for the SFP, the IF and the CF marginal conditions with transaction costs and imperfect competition are given by equations (11) and (10) respectively, and they are equivalent to equations (A1.13) and (A1.14). Thus the effect of SFP with new entrants eligible for the payments is equivalent to the effect of area payments. The proof for perfect competition is analogous.

Q.E.D.

The introduction of SFP entitlement to new entrants will induce a rise of the land rental price from r_t^M to $\mathrm{r}_{\mathrm{ts}}^{\mathrm{M}}$. The rise is equivalent to the per hectare payment *e*. The reason is that there is an increased demand at the margin. Landowners may rent their land to new entrants if the tenants do not pay this price. In the above case, up to area A_E^C (=A_t^M) only incumbent CF could use *e* to bid the rent up, while for the rest of the area, A_E^I (=A^{T} - A_t^M)), only incumbent IF were able to do the same. New entrants were not eligible for *e*. However, if new entrants are eligible for SFP, their marginal benefit of cultivating land equals the marginal value product of land plus per hectare payment *e*. So, a new entrant is willing to offer the landowner a higher price for the land. But the farm (either CF or IF) that currently uses the land is willing to offer to the landowner a price up to $r_t^M + e$ (see figure 2.2). Hence, the new entrant and the farm will bid until the rental price will reach $r_{ts}^M = r_t^M + e$.

If the reserve for new entitlements is temporary, there will be an impact on the dynamics of rents. At the time of the SFP introduction the rental price will rise to $r_{ts}^{m} = r_{t}^{M} + e$, because there will be a demand from new entrants who are willing to pay this price. However, when the reserve will be exhausted this demand will disappear and the price will return back to its pre-reform period level to r_t^M.

In summary, the availability of reserve entitlements for entrants makes that the effects of the new CAP system are very similar to the effects of the old CAP system. When the reserve entitlements stop, the effects shift dramatically. In reality, farm managers, new and current, may have some expectation on when the reserve runs out and rational agents will take this information in consideration. The dynamics of the rental price will reflect this, smoothing the price changes.

2.5. EU accession, CAP Reform, and Farm Restructuring

Accession to the EU not only affects the benefits which the NEMS farms receive, but also the market imperfections themselves. In particular, one should expect transaction costs in the factor markets, including the land market, to reduce, at least gradually, with EU accession. Such reduction in transaction costs comes from a combination of factors, such as legal and institutional requirements for EU accession which improve the legal and institutional framework in which land market transactions occur. Improved profitability in farming from enhanced productivity of the farms and subsidies will also stimulate land transactions and thereby improve experience, transparency, and understanding of the market.

Such improved functioning of the land market through reductions in transaction costs stimulates farm restructuring, transferring land use from less efficient to more efficient organisations. In terms of our model, this implies a shift of land use from the corporate farm to individual farms.[17] To see this consider figure 1.1.[18] The equilibrium in the land market with transaction costs equal to t_2 is (A_{t2}^*, r_{t2}^*). With transaction costs reducing to t_1, the equilibrium shifts to (A_{t1}^*, r_{t1}^*), or when transaction costs fall to zero, the equilibrium becomes (A^*, r^*). It is clear that this implies that land is moved from less productive use by the corporate farm to more productive use by individual farms – the difference in marginal productivity at (A_{t2}^*, r_{t2}^*) equals t_2 – up to the point where the marginal productivity in both types of farms is equal. Furthermore, with increased marginal productivity of land at the equilibrium, equilibrium land rents have increased with falling transaction costs. These results hold in a situation where there are no subsidies. How do CAP subsidies affect this efficiency enhancing effect of EU accession?

Proposition 5 :

a. Area payments have no effect on productivity enhancing restructuring in NEMS.

b. Reform to single farm payments constrains restructuring.[19]

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[17] Notice that we do *not* assume that *all* individual farms are more efficient than *all* corporate farms. We assume that there are some individual farms that can use (some) land more efficiently than some of the corporate farms, as is reflected in the two demand functions. Without imperfections, the rental market will transfer land up to the point where land productivity is equal in corporate farms and individual farms, at the margin. As can be seen from our graphs, we assume an "interior solution", meaning that we assume that in this equilibrium, corporate farms will still use some of the land. These assumptions are consistent with the empirical literature. Studies measuring relative farm efficiencies in CEECs typically find (a) that the relative efficiency depends on various factors, including the types of activities (eg grain, livestock, vegetables, …), institutions, infrastructure and economic conditions, (b) that at least part of the new individual farms are more efficient than the corporate farms they replaced, and (c) that the variations in farm efficiency within the "corporate farm" group and within the "individual farm" group is often larger than between the groups (see e.g. Mathijs and Swinnen, 2001; Gorton and Davidova 2004).

[18] Since the argument here is about the impact of the reduction in transaction costs, we limit our argument to the perfect competition model – the imperfect competition analysis can be obtained from the authors.

[19] It is assumed that entitlements are not transferable. According to the EU regulations 1782/2003 and 795/2004, the EU Member States can impose several restrictions on the transfer of entitlements. For example, lease or similar types of transactions are allowed only if the payment entitlements transferred are accompanied by the transfer of an equivalent number of eligible hectares. A farmer may transfer his payment entitlements without land only after (s)he has used at least 80 % of his payment entitlements during at least one year or, after (s)he has given up voluntarily to the national reserve all the payment entitlements (s)he has not used in the first year of the application of the SFP. Additionally, a Member State may decide that payment entitlements may only be transferred or used within the region. Moreover, Member States may require that in the case of sale of payment

c. *Making SFP available to new farms will stimulate restructuring, but cause a transfer of policy rents from farms to landowners.*

First, let us look at the case of area payments. Figure 2.5 is an extended version of Figure 1.1 to illustrate this case. As in figures 2.1-2.4, the subscript *s* of various curves refers to their shape with area payments *s*. When area payments are introduced, the initial equilibrium with transaction costs t_2 shifts from (A_{t2}^*, r_{t2}^*) to (A_{t2}^*, r_{t2s}^*). The reduction in transaction costs from t_2 to t_1 shifts the equilibrium to (A_{t1}^*, r_{t1s}^*) and when transaction costs disappear (t=0), the equilibrium is (A^*, r_s^*). Notice that the restructuring with the area payments is identical to the restructuring without subsidies. With transaction costs falling to t_1, land use by individual farms increases from A^T - A_{t2}^* to A^T - A_{t1}^* and further to A^T - A^* when transaction costs go to zero. Hence, the area payments have no effect on the restructuring process.

The effect of the SFP on restructuring is different. The eligible area in the case depicted in figure 2.5 is $A_E^C = A_{t2}^*$ for CF and $A_E^I = A^T - A_{t2}^*$ for IF. As we explained before, in this case the demand curves of IF and CF are kinked, with a shift occurring at A_{t2}^* for initial transaction costs t_2. The equilibrium is at (A_{t2}^*, r_{t2}^*). Consider now what happens if transaction costs decline from t_2 to t_1. The kinked land demand curve of IFs shifts up by $\Delta t = t_2 - t_1$. This results in a relatively large change in the rental price, but no change in land allocation. The new equilibrium is (A_{t2}^*, r_{t1e}^*). The increase in rental price ($r_{t1e}^* - r_{t2}^*$) is identical to the decline in transaction costs $t_2 - t_1$, which is larger than with area payments. The reason is that there is no land reallocation because the decline in transaction costs is insufficient to overcome the gap in subsidies between CF and IF for land renting beyond A_{t2}^*. Even with reduced transaction costs, the marginal value of additional land for the IF at A_{t2}^* is

entitlements without land up to 50% and in the case of sale of payment entitlements with land up to 10% must equal to r_{t1e}^*, which is less than r_{t2s}^*, which is the marginal value of land for the CF at A_{t2}^*. Only if the reduction in transaction costs (Δt) is larger than the per unit subsidies (e) there will be restructuring. To see this, consider what happens when transaction costs fall to zero with $\Delta t = t_2 > e$. Now the IF demand curve shifts from D_{t2}^I to D^I for land allocations to the left of A_{t2}^*. This results in a new equilibrium at (A_e^*, r_e^*). The decline in transaction costs is now so large that it more than offsets the subsidy gap at the margin at A_{t2}^* and IFs will rent more land despite the subsidy gap. This results in restructuring, but still less than without subsidies or with area payments. Land use by IFs increases by only $A_{t2}^* - A_e^* < A_{t2}^* - A^*$.

Hence, while some restructuring takes place, it is clear that this is less with SFP than with area payments. In other words, CAP reform will reduce farm restructuring and will restrict productivity gains associated with it. The old CAP system would yield the largest change in land allocation from IF to CF. The SFP may even lead to a total freeze of farm structures if subsidies are large compared to the reduction of transaction costs.

Finally, attempts to address this problem by making new individual farms eligible for SFPs will stimulate farm restructuring but simultaneously induce a shift of policy rents from farms to landowners. The logic is analogous to that of proposition 4. The introduction of additional subsidies for new entrants effectively transforms the SFP situation into an area payments effect at the margin, stimulating more restructuring, but pushing up rental prices as well, shifting CAP benefits to landowners.

In summary, while the introduction of CAP reform in the NEMS will shift CAP benefits from landowners to farms there is an important trade-off. Restructuring which is needed to increase the competitiveness of the NEMS farm system will be constrained. Granting the SFP to new entrants mitigates this problem, but will simultaneously induce a transfer of policy rents to landowners.

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be reverted to national reserve.

More detailed proof of proposition 5 is provided below:

Part a:

Step 1: To show: $\frac{d\left(Q^T/A^T\right)}{dt}<0$, where Q^T is total output, $Q^T = f^I(A^I)+f^C(A^C)$, and thus $\frac{Q^T}{A^T}$ is land productivity. Totally differentiating $\frac{Q^T}{A^T}$ and using (A1.9) then we must show:

(13) $\frac{d\left(Q^T/A^T\right)}{dt}=\frac{\left(f_A^I-f_A^C\right)}{A^T}\frac{dA^I}{dt}<0$

With transaction costs (assuming fixed per unit *t*), perfect competition, and without subsidies condition (A1.6) must be satisfied, as well as:

(14) $pf_A^I=r+t$

(15) $pf_A^C=r$

Totally differentiating equations (A1.6), (14) and (15) yields (A1.9), as well as:

(16) $pf_{AA}^I dA^I-dr=dt$

(17) $pf_{AA}^C dA^C-dr=0$

Using (A1.9), (16) and (17) it follows that:

(18) $\frac{dA^I}{dt}=\frac{1}{pf_{AA}^C+pf_{AA}^I}<0$

From equations (14) and (15) it results that in equilibrium (at point A_{t2}^* in figure 2.5) $f_A^I>f_A^C$ with $t>0$ (with $t_2>0$ in figure 2.5). Hence $f_A^I-f_A^C>0$.

With $\frac{dA^I}{dt}<0$ and $f_A^I-f_A^C>0$, it follows that $\frac{d\left(Q^T/A^T\right)}{dt}<0$.

Step 2: To show: $\left.\frac{d\left(Q^T/A^T\right)}{dt}\right|_{s=0}=\left.\frac{d\left(Q^T/A^T\right)}{dt}\right|_{s>0}$. (13) implies that this will be the case if

$\left.\frac{dA^I}{dt}\right|_{s=0}=\left.\frac{dA^I}{dt}\right|_{s>0}$ and $\left(f_A^I-f_A^C\right)\Big|_{s=0}=\left(f_A^I-f_A^C\right)\Big|_{s>0}$.

From proposition 1 it follows that subsidies do not change land allocation. Hence $\left.\frac{dA^I}{dt}\right|_{s=0}=\left.\frac{dA^I}{dt}\right|_{s>0}$. At the initial equilibrium (A_{t2}^* in figure 2.5), the marginal productivity of land of IF and CF are not affected by s. Hence $\left(f_A^I-f_A^C\right)\Big|_{s=0}=\left(f_A^I-f_A^C\right)\Big|_{s>0}$.

With $\left.\frac{dA^I}{dt}\right|_{s=0}=\left.\frac{dA^I}{dt}\right|_{s>0}$ and $\left(f_A^I-f_A^C\right)\Big|_{s=0}=\left(f_A^I-f_A^C\right)\Big|_{s>0}$, it follows that:

(19) $$\left.\frac{d\left(Q^T/A^T\right)}{dt}\right|_{s=0}=\left.\frac{d\left(Q^T/A^T\right)}{dt}\right|_{s>0}<0.$$

Q.E.D. of part a.

Part b:

Assume $s = e > 0$. Since the SFP effects are not continuous, we analyze part b with discrete changes in t. From (14) and (15) it follows that for all $A^I < A^T - A^*$ (where A^* is the CF equilibrium land renting with $t = 0$) it holds (a) that $f_A^I > f_A^C$, (b) that $\frac{\Delta A^I}{\Delta t}<0$, which implies that $\frac{\Delta\left(Q^T/A^T\right)}{\Delta t}<0$, and (c) that $\left.\frac{\Delta A^I}{\Delta t}\right|_s<\left.\frac{\Delta A^I}{\Delta t}\right|_e$, which implies that $\left.\frac{\Delta\left(Q^T/A^T\right)}{\Delta t}\right|_s<\left.\frac{\Delta\left(Q^T/A^T\right)}{\Delta t}\right|_e$. (This is bounded by $|\Delta t| \leq t$.) What is then left to show is: $\left.\Delta A^I\right|_s>\left.\Delta A^I\right|_e$ for $|\Delta t| \leq t$.

<u>Case 1: $e > |\Delta t| \leq t$</u>

In equilibrium (at A_{t2}^{*} in figure 2.5) for ΔA^{I} >0 the marginal land revenue for the IF remains smaller than the marginal land revenue of the CF:

(20) $pf_{A}^{I} - t < pf_{A}^{C} + e$

IF do not get SFP for ΔA^{I} because they would rent more than the eligible area. The difference between the right hand side of equation (20) and the left hand side of equation (20) is equal to *e*, $\left(pf_{A}^{C} + e\right) - \left(pf_{A}^{I} - t\right) = e$. This follows from proposition 3.

The reverse holds for $\Delta A^{I} < 0$:

(21) $pf_{A}^{I} - t + e > pf_{A}^{C}$, where $\left(pf_{A}^{I} - t + e\right) - pf_{A}^{C} = e$.

Because $e > |\Delta t|$, (20) implies:

(22) $pf_{A}^{I} - \left(t - |\Delta t|\right) < pf_{A}^{C} + e$

Hence, there will be no change in land allocation: $\Delta A^{I}\Big|_{s} > \Delta A^{I}\Big|_{e>|\Delta t|} = 0$.

<u>Case 2: $e < |\Delta t| \leq t$</u>

The equilibrium with SFP (*e*) is determined by condition (A1.6) as well as by:

(23) $pf_{A}^{I} = r + (t - |\Delta t|)$

(24) $pf_{A}^{C} = r - e$

The area payments equilibrium is determined by conditions (A1.5), (A1.6) as well as by:

(25) $pf_{A}^{I} = r + (t - |\Delta t|) - s$

Comparing (23) and (25) implies that for each $|\Delta t| \leq t$ it must be that in equilibrium $f_{A}^{I}\Big|_{s} < f_{A}^{I}\Big|_{e}$, and hence that $\Delta A^{I}\Big|_{s} > \Delta A^{I}\Big|_{e<|\Delta t|}$

Q.E.D. of part b.

Part c: This follows directly from the combination of part a and proposition 4.

Q.E.D.

2.6. Discussion and Conclusions

Eastern enlargement of the EU implies integration of the agricultural economies of the NEMS in the CAP. As a consequence farmers in the NEMS receive area payments for the land they use, gradually increasing over a transition period. In well functioning land markets such payments typically get incorporated in land values and thereby benefit mainly landowners and lead to increases in input costs for farmers. However, NEMS rural land markets are characterized by important imperfections.

In this chapter it was shown that, as long as there is competition from individual farms, domination of the land market by corporate farms and transaction costs will not affect the result that CAP subsidies will end up as increases in land prices and benefit landowners instead of farmers. Furthermore, if the land payments are distributed unequally, for example because of problems of small farms in fulfilling the requirements for obtaining subsidies, small farmers (especially tenant farmers) may even be net losers from the subsidies, while large corporate farms gain, as well as the landowners.

In the last part of the chapter, it was shown how the 2003 CAP reform has both positive and negative efficiency effects in NEMS. While distortions are reduced and policy rents are shifted to farmers, restructuring of the farms is blocked. Mitigating this effect through reserve entitlements causes a reduction in subsidy benefits for farmers as land prices will increase.[20]

[20] There may occur other situations when all or part of the SFP benefit landowners. We identify two main reasons: (i) due to structural changes (e.g. due to change in farm productivity, change in land market transaction costs), and (ii) due to restrictions imposed on the transfers of entitlements. If both conditions hold then landowners will benefit from the SFP. If structural changes affect relative marginal profitability of farms (in our case if IF marginal land profitability is changed relative to CF marginal land profitability) then landowners will benefit from SFP. The intuition is similar to the effect of SFP on farm restructuring shown in section 2.5. Consider the case when transaction costs are reduced from t_2 to t_1 (figure 2.5). Smaller transaction costs increase the land marginal profitability of IF relative to the land marginal profitability of CF. The new equilibrium rent is r_{t1e}^*. Without SFP the rent would increase to r_{t1}^*. Hence, landowners obtain a higher rent with SFP ($r_{te1}^* > r_{t1}^*$)

We should caution about simplistic interpretations the results. How the effects analyzed in this chapter affect rural households in the NEMS depends on whether the households are landowners or farmers, or both, and on the importance of corporate farms. These structural conditions differ strongly between NEMS. For example, farming in countries like Slovakia and the Czech Republic is concentrated on large-scale corporate farms, who rent most of their land. In Slovakia, CF use 88% of farmland. More than 90% of total land used by CF and by IF is rented. Land ownership is very fragmented and many landowners are living in urban areas. (Research Institute of Agricultural Economics). In contrast, in countries such as Poland and Slovenia, farming is dominated by small family farms (IFs), owning most of the land. In Poland, IFs cultivate around 87% of the total land and own most of the cultivated land. Thus, many farmers are also landowners in Poland. That said, it should be noted that (a) there are generational differences, as the most dynamic farmers are typically younger and land ownership is typically concentrated in older rural households, and (b) that there are also important regional variations: in the north and western regions of Poland, larger farms operate on rented (former state farm) land (Csaki and Lerman, 2001; Dries and Swinnen, 2002). Most other countries, such as Hungary and Bulgaria, have a mixed structure. For example, in Hungary, IFs use 59% of farm land and CF use 41%. CF rent most of the land they use, while individual farmers operate on a mixture of owned land and rented land. The share of rented land typically increases with the size of the IF (Vranken and Swinnen, 2003). Many land owners are living in urban areas, but land ownership is less fragmented than in Slovakia.

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and benefit from subsidies. An other situation when landowners may benefit from SFP is when there is a restriction on entitlement transfers between regions. Again, this effect occurs in combination with structural changes. Assume two regions where the total number of entitlements is smaller than the total eligible area. If in region one due to economic growth the agricultural land is shifted to non-agricultural use such that the eligible area is smaller than the total number of entitlements in the region, then if entitlements cannot be shifted to region two, all policy rents will benefit landowners in region one. This effect is similar to the case when new entrants are eligible for SFP shown in proposition 4.

When taking in consideration these facts, the implications of the analysis are different for these countries. The most striking difference is between countries such as Poland and Slovakia. For most farms in Poland, leakages of policy rents to land owners is less of a problem since the dominating farm model is IFs who themselves own the land. There are some problems of rents being concentrated with older farmers who are typically the land owners. In contrast, for many farms in Slovakia and Hungary increased rental rates with the introduction of area payments have a significant impact. Interestingly, there was a persistent view in the 1990s that “land markets are not working” and “prices are very low”. All this has changed dramatically since 2002. The anticipation and the implementation of CAP payments has strongly pushed up land prices and rental rates in Slovakia and Hungary. In both countries, land owners are benefiting from this, but to a larger extent in Hungary than in Slovakia. In Slovakia, large farms are more dominant and have more market power. In addition, fragmentation is more excessive and the concentration of land owners in the cities is stronger. In combination, these factors increased transaction costs for land owners, and reduced their gains. Despite this, CF managers in Slovakia, and in other countries such as the Czech Republic, have started lobbying the government to introduce regulations of land rental prices, which they claim is “unfairly benefiting urban land owners”. An alternative strategy by CF managers was to lock land owners into long term contracts before land prices started increasing. Surveys show that land rental contracts with CF in Slovakia and the Czech Republic are typically longer than with IFs (Swinnen and Vranken, 2004).

The smallest farms in countries such as Slovakia and Hungary may suffer from the subsidies, as they may not get access to subsidies while facing increased land prices. In addition to the administrative hurdles, there is a regulatory limit of one hectare in order to apply for subsidies. However, this disadvantage may be limited as the smallest farms often use own land for farming.

The shift from area payments to decoupled single farm payments is planned in a few years in NEMS. The impact on income distribution will be limited in Poland but significantly in Slovakia and Hungary. Large CFs are likely to benefit very strongly from the decoupled farm payments, as the rents are likely to fall and large income transfers will benefit them directly.

Finally, this change in subsidy instruments may have an undesirable effect on restructuring, which is important to increase the competitiveness of the farm sector in the NEMS. The shift to SFPs will limit the pressure for restructuring. In some of the countries, especially Slovakia and Czech Republic, this is likely to constrain much needed further restructuring of some of the corporate farms. This is especially the case since the subsidies will increase rapidly over the 2005 – 2013 period and will be large by the time of the SFP introduction, possibly outweighing the gains in transaction cost reductions. In this case the constraining effect may be very strong.

CHAPTER 3. Credit Constraints[21]

3.1. Introduction

The second chapter analyzed how land market imperfections affect the welfare effects of introducing the CAP area subsidies in NEMS. This chapter considers a general model of agricultural sector and introduces credit market imperfections. Little attention has been paid to constraints in factor markets in the literature on distributional effects of agricultural policies. The reason is probably that this literature has strongly focused on OECD countries. In contrast, studies analyzing effects of agricultural polices in developing or transition countries, often include market imperfections as key feature of their models (e.g. Bellemare and Barrett 2006; Bhattacharyya, Bhattacharyya, and Kumbhakar, 1996; Fafchamps and Hill 2005; de Janvry, Fafchamps, and Sadoulet, 1991; Rizov and Swinnen, 2004; Sadoulet, de Janvry, and Benjamin, 1998). However the focus of these studies is how market imperfections affect reactions of agents to policy changes and not the distribution of policy rents.

The present chapter is the first to analyze how credit constraints affect the distributional effects of subsidy program. This is somewhat remarkable given the prevalence

[21] This chapter is based on the paper which is under review process in the American Journal of Agricultural Economics.

of credit market imperfections in agriculture. It is well known that rural credit market imperfections are widespread in developing and transition countries (eg. Carter, 1988; Swinnen and Gow, 1997).[22] However, studies show that also in the US and the EU, farms' access to credit is constrained. In an empirical study of French farmers, Blancard et al (2006) find that two-thirds of the farmers in their sample are credit constraint in the short run and all of them are credit constrained in the long run. Lee and Chambers (1986) and Färe, Grosskopf, and Lee (1990) find that at least part of the US farms in their study are credit constrained.

The objective of the present paper is to analyze how credit constraints affect the distributional effects of subsidy programs. The policy on which this chapter focuses is an area payment (subsidies per unit of agricultural land). Area payments are an important form of agricultural subsidies. In 2007, the EU alone spent around 30 billion euros on area payments. The importance of area payments as policy instrument is reflected in the fact that several recent studies have analyzed their effect, including Alston (2007), Kirwan (2005), OECD (2005). However none of these studies considers the effect of imperfect credit markets.

3.2. The Model

Consider an agricultural economy with n identical farms. The output of each farm is a function of the amount of land (A) and non-land inputs (K), which we refer to as "fertilizer" but which captures also other capital inputs used by the farm. The production function is represented by $f(A,K)$ with $f_i > 0$, $f_{ii} < 0$, $f_{ij} > 0$, for i, j = A and K. Total land available is assumed to be fixed, A^T. End of the season profits are:

[22] There is a vast theoretical and empirical literature on imperfections in rural credit markets, including the seminal work of Stiglitz and Weiss (1981).

(26) $\prod = pf(A,K) - rA - kK(1+i)$

where p is the price of the final product, r is the price of land, k is the per unit price of fertilizers and i is interest rate. We assume that the economy is small and open, which implies that the fertilizer price and the output price are fixed. Similarly, we assume that agriculture is small in terms of credit use and unable to affect interest rates.[23]

An important issue is the timing of the various activities and payments throughout the season. We assume that fertilizers have to be paid at the start of the season while payment of land rents to owners and farms' revenues from selling the harvest occur at the end of the season, after harvest.[24] Other inputs, i.e. fertilizer K, need to be financed at the start of the season. This can be done through internal finance (savings or cash flow) and/or through credit.

Perfect Credit Market

To establish a point of comparison let us first identify the equilibrium without credit market constraints. With perfect credit markets, farms are not constrained on the quantity of inputs they use. Farms will choose the quantity of land and fertilizer that will maximize their profits

[23] Stiglitz and Weiss (1981) showed that if there are different distinguishable groups of borrowers in the economy, the equilibrium interest rates are set such that banks' returns per dollar from each group will be equal. If this is not the case, then bank *i* (which lends to groups that give small returns) would be willing to offer a better contract to a group that brings high returns and take away that group of borrowers from competing banks. This arbitrage takes until banks' returns will equal for all groups. If banks' returns from lending to group *j* are lower than the costs of lending, then banks will not lend funds to group *j*. In perfect competition bank returns will equal bank costs. Note that that the loan rate charged or collateral required by banks will differ among the distinguishable groups of borrowers, while bank return obtained from each group will be the same. For example, riskier borrowers may be charged higher interest rate in equilibrium than low-risk borrower. In this context, if agricultural sector is small, it cannot affect the return that the bank will earn from loaned funds. Banks will set such a contract to farms to earn the equilibrium bank market return (opportunity costs) for loaned funds.

[24] Although there are no systematic data on this, our inquiries indicate that these assumptions are consistent with reality. When land rents are paid in kind or through sharecropping this obviously implies that they are paid after the harvest; but also cash payments tend to be paid at the end of the year/season.

given by equation (26). This implies the following equilibrium conditions (for notational simplicity the interest rate i is set equal to zero ($i = 0$)): [25]

(27) $pf_A - r = 0$

(28) $pf_K - k = 0$

(29) $A = A^T$

Conditions (27) – (29) determine the farm's input demand functions. Total land demand is the aggregate of all n farms land demand functions and represented by function D in figure 3.1. For illustrative purposes we use linear functions in the figures. The results which we illustrate hold in general, as proven by the mathematical derivations – most of which are in Appendix. In figure 3.1, with fixed land supply A^T and land demand D, the equilibrium rent is r^*.

The distribution of policy rents resulting from area payments in this case are well known. When there is one input fixed in supply and with fixed prices of other inputs and fixed output price, farmers will not benefit from subsidies and all benefits will go to the suppliers of the inelastic input, land in this case (see e.g. Alston and James, 2002; Alston, 2007; Gardner, 1983; Just, Hueth, and Schmitz 2004).

However, this conclusion assumes that credit markets work perfectly (or, in other words, that there are no constraints on the supply of other inputs (fertilizers)). In the next section we will show that these results change when access to credit is constrained.

[25] While this may appear at first sight as a strange assumption in an analysis of credit market imperfections, this assumption does not affect the results because credit market imperfections in this paper are modelled as constraints on the amount of credit rather then its cost, as is standard in the literature (see further). Hence setting i=0 merely simplifies the notation, but does not affect the results.

3.3. Imperfect Credit Market

To model the imperfect credit market, we use the approach of Feder (1985) and Carter and Wiebe (1990) by introducing a farm credit constraint.[26] It is assumed that the maximum amount of credit available to farm, S, depends on farm characteristics (W) such as reputation, farm size and wealth. That is $S = S(W)$ with $S_W > 0$. The credit constraint is given by:

(30) $kK \leq S(W)$

With a credit constraint the decision-making problem of the farms is the maximization of the end-season profit functions, as given by equation (26), subject to credit constraint (30), as represented by the LaGrangean function:

(31) $\Psi = pf(A,K) - rA - kK - \lambda(kK - S)$

where λ is the shadow price of the credit constraint.

When the credit constraint is binding farms cannot use the unconstrained optimal level of fertilizers and fertilizer use is determined by $K = \frac{S(W)}{k}$. Farms then choose their land allocation to maximize profits, treating fertilizer use as fixed.[27]

The optimal conditions with binding credit constraints ($\lambda > 0$) are given by (29) as well as by:

(32) $pf_A + r = 0$

(33) $pf_K - k(1+\lambda) = 0$

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[26] See also Carter (1988) for a credit rationing model for the farm sector in the context of developing countries and Barry and Robinson (2001) for a more elaborate discussion of credit markets in agriculture.

[27] In similar context Just, Hueth, and Schmitz (2004) analyze the welfare measurement with constrained input use due to policy intervention. The difference here is that we consider the input constraint caused by insufficient credit and its interaction with area payments.

(34) $kK - S = 0$.

From equation (33) it follows that the marginal value product of fertilizers is higher than the marginal cost of fertilizers *k*: $pf_K > k$. By increasing fertilizer use the farm could increase its profit but it cannot because of the credit constraint. From the characteristics of the production function ($f_{AK} > 0$) it also follows that credit constraints affect the land market. The more credit constrained farms are, the less fertilizers they use and the lower their land demand, ceteris paribus.

The effect of credit constraints on the land market is illustrated in figure 3.1. As explained before, the aggregate land demand curve without credit constraints is *D*. The equilibrium rent without credit constraints is r^*. When credit is constrained, farm land demand shifts to D_c. At low levels of output (and thus land use) the credit constraint is not binding, and the constrained demand curve D_c coincides with the unconstrained demand curve *D*. This is up to the point x where the credit constraint becomes binding and the constrained demand curve shifts below the unconstrained demand curve. The gap between D and D_c increases for higher levels of land as the reduction in productivity caused by the credit constraint increases. With the credit constraint binding, and reflected in D_c, the new equilibrium land rent is r_c^*. The equilibrium rent declines to $r_c^* < r^*$.

Notice that while land demand is affected, land use is not affected in figure 3.1. The functions, as drawn, assume that even with credit constraints the marginal value products of all the land available (A^T) is positive (as the land demand function still lies above the vertical axis at A^T). Hence, if this is the case, all the adjustments in the land market occur through price adjustments while in the fertilizer market they occur through quantity adjustments with fixed prices.

3.4. Impact of Area Payments

Define s as the subsidy (area payment) per unit of land, and assume that all land in the analysis qualifies for the subsidies. The representative farm objective function then changes to

(35) $\Pi = pf(A,K) - (r-s)A - kK$.

However, not only the objective function will change; also the credit constraint is affected. The payments will alleviate the credit constraint of the farm. In reality farms may receive the subsidies at the beginning or at the end of the season. It may be at the end because of administrative delays or because of administrative controls to check the eligibility of the farms which need to take place during the growing season.[28]

If the farm receives the subsidies at the beginning of the season, farm can use the funds directly to pay for the fertilizer. However, even if farms receive subsidies at the end of the season, this can still improve their access to credit. If farms and potential lenders know that subsidies will be paid at the end of the season, then farmers may be able to use these future (guaranteed) payments to obtain credit from credit institutions at the beginning of the season. For example, our own research in Eastern Europe showed that the provision of area payments under the EU's CAP had a major effect on farms' access to credit. We found from field interviews that banks and other lenders are more willing to provide credit to farms when they know that such subsidies will be paid. In a sense, (the promise of) subsidies are used as collateral for credit. For example, banks in Slovakia provide credit to farms up to 100% of their area payments in 2007, so the farms can use the funds to finance expenses at the start of

[28] In reality, policies may impose restrictions on which land can receive payments. Restrictions may relate to crop choice, set-aside requirements, cross-compliance, etc. These restrictions may affect the distributional effects. Here we analyze the case when all land does qualify for subsidies.

the growing season. To obtain such loans, the farms need to have an account at the bank where the area payments will be deposited later by the official paying agency, and the banks have control over the account in order to recuperate the pre-financing.

In our analysis, we allow for subsidies to arrive either at the start of the season or after harvest. With area payments the credit constraint is given as follows:

(36) $kK \leq S(W) + \alpha sA$,

where $0 \leq \alpha \leq 1$, and α measures the extent to which the farm can use subsidies to alleviate its credit constraint. If the farm receives subsidies at the beginning of the season, the farm can use all subsidies to alleviate the credit constraint: in this case $\alpha = 1$. However, if the farm receives the subsidy at the end of the season, it may obtain an amount of credit equivalent to the size of the subsidy or less, depending on the farm's ability to borrow. In this case $0 \leq \alpha \leq 1$.

Proposition 6: *When farms are credit constrained it holds that with the introduction of area payments (and with farms being able to use subsidies to alleviate their credit constraint, $\alpha > 0$) land rents increase by more than the subsidy.*

Proof: see Appendix A3.

Land rents will increase with area payments, but contrary to when there are no credit constraints, the increase in rent is higher than the allocated subsidy, *s*. This is because the payments have two effects on land rents, a direct and an indirect one. This is illustrated in figure 3.2. The initial equilibrium rent with credit constraints is r_c^*. The first, direct, effect is the standard effect of subsidies with a fixed production factor (land): because farms are granted subsidies per hectare they rent, this increases marginal returns to land, and increases farms' willingness to pay a higher rent equivalent to the size of the subsidy *s*. This effect is reflected in the an upward parallel shift of land demand D_c to $D_c + s$. This effect alone would result in land market rent, r_{cs}^{s}. The increase in rent is equal to the size of the subsidy s, r_{cs}^{s} - r_c^* = s.

The second, indirect, effect is that the subsidies relax farms' credit constraints which allows farms to purchase more fertilizer. This increases the marginal value product of land if farms are credit constrained and further increases farms' land demand, thereby inducing a higher rent, reinforcing the first, direct, effect. This second effect results in a further shift of land demand from $D_c + s$ to D_{cs}. The equilibrium rent is r_{cs}^*. It is clear from figure 3.2 that the rent rises by more than the subsidy, r_{cs}^* - r_c^* > s.

The size of this second effect depends on the impact of the subsidy on the credit constraint. In figure 3.2 we assume that the subsidy reduces the credit constraint but does not fully remove it over the domain $0 - A^T$. More specifically, the subsidy causes the credit constraint to be no longer binding over the interval $A^c - A^s$, and to constrain the land productivity less over the domain $A^s - A^T$. Beyond A^c, the vertical distance between D_c. and D_{cs} increases with land renting. Graphically this is reflected in the fact that over this domain the land demand function without subsidy (D_c) is not parallel with the land demand with subsidy (D_{cs}). The (absolute value of) slope of the land demand with subsidy (D_{cs}) decreases relative to the slope of the land demand without subsidy (D_c).

In drawing D_{cs} we assumed that the credit constraint is still binding over the area $A^s - A^T$. If the subsidy effect would be so strong to remove the constraint over the whole $0 - A^T$ domain, the land demand function would shift to D^s and the resulting land rent would be r_s^*. However, it is important to realize that even if the second effect has only a small impact on the land demand, the combined effect will be that the land rent goes up by more than the subsidy s.

Proposition 7: *When farms are homogenous and are credit constrained, it holds that with the introduction of area payments (and with farms being able to use subsidies to alleviate their credit constraint,* $\alpha > 0$*) all farms lose compared to the case without subsidies.*

Proof: see Appendix A4 part a.

A formal derivation is in Appendix A2. The graphical analysis is in figure 3.2. To simplify the graph and the discussion, we consider the extreme case when the subsidies fully solve the credit constraint (the formal analysis in Appendix hold for the general case). The subsidy shifts demand to D_s and land rent to r_s^*. Farms gain from subsidies and from improved productivity with reduced credit constraints; they lose from the increase in land rents. First, the farms' gains from subsidies equal area *ABCE* and this is identical to the losses from the "direct" effect of the subsidies on land rents (also area *ABCE*). So these two effects exactly offset each other. Second, the farms' gains from improved productivity with reduced credit constraints equal area *CFG*. The farms' losses from the "indirect" effect on land prices is represented by area *CGHJ*. The net effect is always negative: the net losses to farms equal area *CFHJ*, which is the difference between area *CGHJ*, which is equivalent to area *CGKE* (indirect loss), and area *CFG* (productivity gains).[29]

The intuition behind this result is as follows. While the subsidy is the same for all land, this is not the case for the effect of the credit constraint. If the farms would use land up to A^c, there would be no additional effect of the credit constraint reduction on land rents. Beyond A^c, the effect of the credit constraint on farm productivity ($f_{AK} > 0$) increases with

[29] Note that these changes incorporate adjustments in fertilizers use and that the welfare change represented by area *CFHJ* in figure 3.2 is an accurate representation of farm profit change induced by the subsidy. (see Just, Hueth, and Schmitz 2004 for a general discussion and applications to different issues).

land renting. The productivity loss is represented by the distance between the D and D_c functions, which increases with land use. The gap is highest at A^T.

Reducing the credit constraint has the strongest effect at the margin, where the credit constraint is strongest, and where the land rent is determined. At the margin the increase in productivity with reduced credit constraints equals the additional increase in land rents. However for the rest of the land this is not the case. As a consequence the gains in land productivity are lower than the increase of the land rent for all the land except for the unit at the margin.

Proposition 8: *When farms are credit constrained it holds that with the introduction of area payments (and with farms being able to use subsidies to alleviate their credit constraint, $\alpha > 0$) total welfare increases.*

Proof: see Appendix A4 part b.

The welfare effects are also illustrated in figure 3.2. Landowners gain from the higher rental price. Their gains are equal to area *ABGK*. Area *ABCE* is the size of the total subsidy, which equals the taxpayers' cost. The net losses to farms equal area *CFHJ*. From the assumption of a small and open economy, with fixed prices for fertilizer, output, and fixed interest rates, it follows that the welfare of fertilizer suppliers, credit suppliers and consumers will not be affected by the subsidies. Hence, the total welfare effect is positive and equals area *CFG*. Total welfare increases because the subsidies solve the credit market imperfection and thereby increase productivity, and total production.[30] Notice that in this specific case

[30] There exist a value of the area subsidy denoted as s_c which exactly removes the farm credit constraint. If the actual subsidy *s* is lower than s_c ($s < s_c$) then farms remain credit constraint with *s*. If the actual subsidy *s* is higher than s_c ($s > s_c$) then farms are no longer credit constrained with *s*. The maximum welfare gain is with

there are no deadweight costs because the land supply is assumed fixed and all land receives subsidies. Hence, there are no distortions in land allocation.

3.5. Heterogeneous farms

The analysis so far assumed that farms were identical. We will now relax this assumption. For simplicity we consider the situation when there are two farms who differ in their credit constraints.[31]

The effect of differences in credit constraints on the land allocation and the land rent is illustrated in figure 3.3. The land demand curves of farm 1 and farm 2 without credit constraints are D^1 and D^2 and their land use is A^1 and A^2, respectively, with $A^2 = A^T - A^1$. The equilibrium without credit constraint is (A^*, r^*). When credit is constrained, the land demand curves of farm 1 and farm 2 shift to D_c^1 and D_c^2, respectively. The new equilibrium shifts to (A_c^*, r_c^*). The land market rent declines, $r_c^* < r^*$. The change in land allocation between farms depends on the farms' relative credit constraints. In the case illustrated in

the subsidy s_c because it removes the farm credit constraint. In this partial equilibrium model the subsidy is the first-best policy because it corrects market imperfections while it does not create distortions. If one takes in consideration welfare losses induced by taxes (which are needed to finance the subsidy) then the first best outcome cannot be achieved.

[31] Empirical evidence shows important differences among farms in their credit constraints. For example, Bierlen and Featherstone (1998) find in the US that a farms' debt levels are the strongest determinant of credit constraints, while asset size and age are less important. Benjamin and Phimister (2002) find that differences in the structure of agricultural credit markets alter farm credit constraints. They find that in the case of the UK where non-specialized commercial banks dominate and with little government interventions, farms with less collateral were more credit constrained, while in France with dominant specialized agricultural cooperative bank and with extensive government interventions, farm credit is less dependent on collateral. Closer relationships between the cooperative bank and farms in France address better information asymmetry and reduce the reliance on collateral. Bezemer (2003) finds in the case of the Czech Republic that long-established and larger corporate farms have better access to credit than small individual farms. Latruffe (2005) finds in the case of Poland that farmers with more assets were less credit constrained than others. This may differ from the situation in more developed market economies.

figure 3.3, farm 2 is assumed to be more credit constrained than farm 1. As a result, farm 2 renting is lower by $A_c^* - A^*$, compared to the unconstrained equilibrium.

Proposition 9: *When farms differ in their credit constraints it holds that with the introduction of area payments (and with farms being able to use subsidies to alleviate their credit constraint, $\alpha^i > 0$), the farms that are less credit constrained will loose and farms that are more credit constrained may gain.*

Proof: see Appendix A5.

Again the formal derivations are in appendix and we use a graphical analysis to illustrate these effects (figure 3.3). With area payment *s*, farm 2 land demand shifts upwards, from D_c^2 to D_{cs}^2. Farm 1 demand shifts from D_c^1 to D_{cs}^1. As explained earlier, we have two effects. First, farm 1 and 2 land demand shift to D_{cs1}^1 and to D_{cs1}^2, respectively, because of the direct subsidy effect which increase marginal returns to land. This results in a higher land market rent, r_{cs}^s. The increase in rent is equal to the size of the subsidy *s* (r_{cs}^s - r_c^* = *s*) and affects both farms simultaneously. Second, because farms can use subsidies to buy more fertilizers, this increases the marginal productivity of land and thus land demand. This indirect effect results in a further shift of farm 1 land demand from D_{cs1}^1 to D_{cs}^1, and for farm 2 from D_{cs1}^2 to D_{cs}^2. The equilibrium is (A_{cs}^*, r_{cs}^*). It is clear from figure 3.3 that the rent rises by more than the subsidy (r_{cs}^* - r_c^* > *s*) as in the case with homogenous farms.

However now the impact differs between the two farms. While both farms see their credit constraint reduced and will increase fertilizer use and thereby increase their productivity, this effect is stronger (at the margin) for the farm which has the strongest marginal productivity losses due to credit constraints. The farm which is most credit constrained before receiving the subsidy, i.e. farm 2, will increase its land use because it benefits most from the reduction in its credit constraint, leading to higher land marginal productivity gains. The farm which is less credit constrained, i.e. farm 1, definitely loses because its increase in land rental costs $(r_{cs}^* - r_c^*)$ is higher than the increase in marginal return of land for every hectare it rents (the distance between D_{cs}^1 and D_c^1 is smaller than $(r_{cs}^* - r_c^*)$ for land renting equal to or smaller than A_{cs}^*). Its total losses are equal to area *JKL* minus area *CEGK* (*<0*). The farm which is most credit constrained, i.e. farm 2 in figure 3.3, may gain or may lose, depending on whether the increase in returns to land (the distance between D_{cs}^2 and D_c^2 for land renting smaller than $A^T - A_{cs}^*$) are larger or smaller than the increase in land rent $(r_{cs}^* - r_c^*)$. In figure 3.3 it is unclear whether area *LMON* minus area *EFHM* is positive or negative – and this result holds in general (see proof in Appendix A5).

If the differences in credit constraints are small, both farms will lose. As an illustration of this, notice that in the extreme when differences are small, we end up with the case of homogenous farms. As we have shown before, all farms will lose from area payments in this case (see propositions 6 and 7). However, if there is a sufficiently large difference in credit constraints, and hence a sufficiently strong productivity effect at the margin for the most constrained farm (farm 2), farm 2 may gain. Moreover, while farm 1 will always lose, under specific conditions it is possible that the aggregate impact on farms is positive, i.e. that the sum of area *JKL* and area *LMON* is larger than the sum of area *CEGK* and area *EFHM*. This may occur in the case when farms that are less credit constrained have very elastic land demand and farms that are more credit constrained have a relatively high increase in productivity induced by more fertilizer use. In this case the indirect effect of subsidies on the equilibrium land rent is small while credit constrained farms have high productivity gains. This is illustrated in figure 3.4 which presents a case where farm 2 has important credit constraint and farm 1 has no credit constraint. The land demand elasticity of farm 1 is high.

With high farm 1 demand elasticity, the impact of farm 2 productivity gains on land rents is small and its net gains in productivity (area *GHNM*) are larger than the net losses in higher land rents (area *DELH*). The losses to farm 1 are small given by area *CDGF* and this loss decreases with the farm 1 demand elasticity. The aggregate impact of area payments on farm profits is likely to be positive as losses are small (area *DELH* and area *CDGF*) and gains are large (area *GHNM*). In other cases farms are likely to lose on aggregate.

3.6. Sensitivity Analyses and Household Effects

To analyze the sensitivity of our findings to some of our assumptions, we use a simple simulation exercise. We simulate the model with homogenous farms, using a Cobb-Douglas production function, $Q = BA^{\beta_1} K^{\beta_2}$, where B is a constant and β_1 and β_2 are input parameters.

Data for France were used to calibrate the model. We use average data for 2003 and 2004 (sources are European Commission and Eurostat). Total agricultural output was used as proxy for Q, non-land costs were used as proxy for K, and utilized agricultural area was used as proxy for A. The cost share of land in total costs of agricultural production β_1 was calculated from the Farm Accountancy Data Network (FADN) and equals approximately 0.1. This is lower than the value which Alston (2007) used (land cost share equal to 0.2) in a simulation model for the US. However, other studies also use lower land cost shares for the EU than for the US. OECD (2000) estimates the land cost share for different crops in the EU between 0.14 and 0.18, and in the US between 0.21 and 0.27. The GTAP model for grains uses a land cost share of 0.12 for the EU and 0.2 for North America (van Meijl and F. van Tongeren, 1999). Given the fact that France is relatively land abundant within the EU, its land cost share can be expected to be even smaller than the EU average. We use 0.1, but will vary this parameter to asses the sensitivity of the results. With a Cobb-Douglas production function, the cost share of non-land inputs in total costs of agricultural production β_2 was 0.9. To account for the credit constraint, we used estimations of Blancard et. al (2006) to set the shadow price of the credit constraint equal to 1.35. We also vary this parameter.

Consistent with the theoretical model our base simulation model has a fixed land supply and infinitely elastic output demand and fertilizer supply. We then relax these assumptions with simulations using different elasticities of land supply, output demand and fertilizer supply. Following Alston (2007) we use land supply elasticities of 0.1 and 0.2. The most commonly used values of output demand elasticities in the literature are between -0.1 and -0.7 (e.g. Floyd 1965; Hertel, 1989; Tiffin and Tiffin, 1999; de Crombrugghe et. al, 1997; Van Driel, Nadall, and Zeelenberg, 1997; OECD, 2000; FAPRI). We use variations in output demand elasticities of -0.3, -0.7 and infinity. Supply elasticities of non-land inputs in the literature vary widely: between 0.1 and 3 (Balcombe and Prakash, 2000; Floyd 1965; OECD, 2000; Ryan and Duncan, 1974; Thijssen, 1988), because it covers a wide range of inputs (e.g. fertilizers, fuel, labour) which have various reactions to prices. It also depends whether inputs are farm supplied or purchased. Purchased inputs tend to be more elastic than farm supplied inputs. In our simulations we will use 0.5, and 1.5, and infinity.

The results are summarized in table 3.1. The numbers represent losses or benefits from the introduction of area subsidies measured as a share of total subsidies. The results are consistent with the theory. The basic simulation shows that farms loose (-12%), while landowners gain more than the subsidy (178%) with a fixed land supply and with infinitely elastic output demand and fertilizers supply. Total welfare increases by 67% of the subsidy amount.

Models 2 and 3 show that with lower elasticity of non-land input supply non-land input producers (i.e. capital input suppliers) get part of the rents (20% to 33%). As a result, slightly less policy rents are transferred to landowners but farms lose even more (-53% to -81%). Also welfare increases less (+20% to +40%).

A similar effect occurs with less elastic output demand. Now consumers also benefit from the subsidy (+165 to +381%) while most of these consumer benefits come from strong decreases in farm surplus (-160% to -355%), and less effects on landowners and total welfare.

With more elastic land supply (model 6 and 7) farms gain, but only limited: from 1% to 13%. These gains come from landowners whose gains are lower.

A higher α implies higher losses to farms (-18) because the "indirect" productivity effect increases with α. Landowners benefit more: +217% in model 9.[32] A higher β_1 (hence lower β_2) (model 10) also implies larger losses to farms (-24%) and higher gains to landowners (+190%). Benefits from policy to landowners increase with the importance of land in the production. On the other hand, with credit constraint, the increase in productivity (and increase in land prices) caused by the alleviation of credit constraint decreases with lower β_2. In the simulation in table 3.2 the former effect is stronger then the latter effect.

Finally, from a policy perspective it is obviously important when interpreting these distributional effects whether "farms" and "landowners" are the same persons (or households), or not. These structural conditions differ strongly around the world (Swinnen, Stanley, and Vranken, 2006). For example, farms rent more than 65% of their land in EU countries like Slovakia, the Czech Republic, Belgium and France. Many landowners are living in urban areas. In contrast, in countries such as Ireland, Poland, Latvia, and Italy, on aggregate farms own more than 70% of their land. The situation in the US is in between both groups of countries.

[32] Notice that with $\alpha = 0$ all policy benefits go to landowners. In this case farms cannot use subsidies to alleviate their credit constraint; and the results are identical to the case when there are no credit constraints.

To measure the implications, table 3.2 presents simulations results for three scenarios: farms own 25%, 50%, or 75% of their land, respectively. The results in table 3.2 show that land-owning-farms gain from area payments except (a) when they own relatively little land (25%) and the supply of non-land inputs is inelastic and (b) when demand is inelastic. The latter is an important result since this applies to most developed countries, and farming households even lose when they own most of their land (75%).

3.7. Discussion and Conclusions

In this chapter we have shown that imperfections in rural credit markets may strongly affect the incidence of agricultural policy. When farms are credit constrained, the introduction of area payments will lead to even larger gains for landowners as land rents will increase by more than the subsidy. This is because the subsidies will reduce farms' credit constraints and thereby increase marginal productivity of land and thus land demand. This will increase land prices in addition to the direct subsidy effect. The effect of area payments on farm profits with homogenous farms is negative. Farms gain directly from the subsidy and indirectly from the increase in productivity. However they lose from the increase in land rents. The land rent increase is larger than their gains, causing a negative net impact. If farms are heterogeneous, the most credit constrained farms (ex ante) and those which are most effective in using the subsidies for the reduction of their credit constraints may gain.

The model used in this chapter is applicable to any economy where farmers face credit constraints. This is typically case in the developing countries where credit market imperfections are well documented (Binswanger and Rosenzweig, 1986; Conning and Udry, 2005). Rural credit constraints in developing economies are closely associated with access to land (Feder, 1985; Carter and Wiebe, 1990; Heltberg, 1998; Carter and Olinto, 2003).

Binswanger and Rosenzweig (1986) showed that land is one of the most suitable asset to be used as a collateral because it satisfies three main conditions: appropriabilitty, absence of collateral-specific risk, and accrual of the returns to the borrower during the loan period. Land ownership is unequally distributed in many developing countries which leads to a differential access to credits with the strongest credit constraint facing landless farms. The combination of unequal land ownership (or unequal wealth ownership in general) and credit constraints results in unequal income distribution and welfare losses which may persist over time (Galor and Zeira, 1993; Tsiddon, 1992; Carter and Barham, 1996; Binswanger and Deininger 1997). The analysis of this chapter indicate that a better farms' credit access leads to expansion of the most constrained farms and to welfare gains. Many developing countries have implemented policies to address credit market imperfections (Conning and Udry, 2005). However, many of these polices resulted in a biased allocation of credit benefiting mostly medium and large farms and thus further strengthening their access to credit (Adams, Graham, and Von Pischke 1984; Von Pischke, Donald, and Adams 1983; Binswanger and Deininger 1997; Burgess and Pande 2003). This was either because developing countries face many market imperfections and addressing credit market imperfection alone is not sufficient, or because richer farmers are more successful in lobbing governments.

CHAPTER 4. Reforms

4.1. Introduction

A well functioning land market facilitates land transfer from less productive farms to more productive ones and leads to efficient allocation of resources. The literature has analyzed different factors that affect the efficiency of the land market such as imperfect credit markets (Carter and Salgado, 2001; Kevane, 1996; Shaban, 1991 and Laffont and Matoussi, 1995), labor market imperfections (Yao, 2000), insecure property rights (Feder, Onchan, and Raparla, 1988 and Alston et al, 1995 and 1996), missing insurance markets (Cain, 1981), complexity of the processing and marketing of agricultural products (Kutcher and Scandizzo, 1981), economy of scale in agriculture and lumpy inputs (Rao, 1975), and policy distortions (Feldstein, 1980 and Brandao and Rezende, 1992).

An important assumption of all these studies is perfect competition in the land markets. This is not realistic in many regions where land use is dominated by large farms, such as, for example, in Latin American or in several African countries. Similarly, in several transition countries large corporate farms use a large share of agricultural land. For example, they use more than 80% in countries such as Belarus, Slovakia, and Russia and more than 50% in the Czech Republic, Bulgaria, Kazakhstan, and Ukraine (see table 1.1). The average size of large farms is around 500 to 1000 hectares, but in Kazakhstan and Russia some farming companies use more than 100,000 hectares.

Large scale corporate farms continue to use large parts of the land because of a variety of reasons. However, an important reason is that historically, the large-scale farms were the users of the land and transaction costs constrain the shift of land to new farms (see chapter 1).

The interaction of imperfect competition and transaction costs has a strong impact on the efficiency of the land market, and on land prices and payments. In several transition countries there is a large gap in rental prices between land used by corporate farms and land used by individual farms. For example, Vranken and Swinnen (2006) find that in Hungary land prices are lower in regions where corporate farms dominate. Table 1.2 shows how in the Czech Republic and Slovakia land rents paid by corporate farms are generally much lower: most vary between 50% and 20% of the rents paid by family farms. Further, in several countries, corporate farms are more likely to pay their rents in kind, while family farms are more likely to pay cash or mixed cash/in-kind (Swinnen and Vranken, 2005).

The objective of this chapter is to explicitly model imperfect competition in the land market and to analyze the efficiency and welfare effects of reforms which reduce transaction costs. We show that the efficiency gains from transaction cost reductions are mitigated, and can even be offset. To show these effects, we use a model which incorporates features which are consistent with the land market situation in transition countries where large farms remain important. However, the analysis and figures in this chapter are relevant as well for other parts of the world with unequal land use, such as in Latin America or Africa.

The analysis in this chapter is related to studies on second best polices and policy effects in the presence of distortion (see e.g. Lipsey and Lancaster, 1956; Aronsson and Blomquist, 2003; Blackorby, Davidson, and Schworm, 1991; Boadway and Harris, 1977; Milner, 1992 in general and Alston, Edwards, and Freebairn, 1988; Murphy, Furtan, and

Schmitz, 1993; Innes, 2002 in agricultural policies). The chapter is, to our knowledge, the first to analyze these issues in the context of land markets and reforms.

4.2. The Equilibrium with Perfect Competition

In chapter 1 it was shown (see also appendix A6) that with increasing transaction costs, the share of land used by corporate farms is higher and the rent they pay is lower. With transaction costs as shown in figure 1.1, the equilibrium is at (A_{t1}^*, r_{t1}^*) and (A_{t2}^*, r_{t2}^*) for transaction costs t_1 and t_2, respectively. Transaction costs allow CF to use more land and at lower costs. Their gains are equal to area *A* for transaction costs t_2.

Only the CF benefit from these reduced rents. The losses of IFs are equal to area *DE* for transaction costs t_2. Landowners also lose because their income from land rents declines: without transaction costs they receive r^* per unit of land; with transaction costs t_2 they only get r_{t2}^*. Their losses are equal to area *ABC* for transaction costs t_2. The net aggregate welfare losses with t_2 are equal to area *BCDE* with *EC* measuring the total transaction costs and area *DB*, measuring the deadweight costs of the induced economic distortions (see appendix A6).

4.3. Imperfect Competition

Corporate farms are not price takers in the land rental market in many regions. For example, in countries such as Russia, Slovakia, Tajikistan, Turkmenistan, and Uzbekistan, among others, where they occupy more than 80% of the land (see table 1.1), CF have important market power.[33]

In chapter 1 it was shown that the combination of imperfect competition and transaction costs results in extra benefits for the CF. As figure 1.2 shows, relative to the

[33] Even in countries where their average share is lower, there may be imperfect competition in certain regions.

competitive equilibrium without transaction costs (A^*, r^*), the surplus gains of the CF with imperfect competition and transaction costs t equals area *ABDE*. Landowners lose twice as both factors put a downward pressure on rental prices. Their combined loss equals area *ABDEGHLN* (figure 1.2 and appendix A7).

For individual farms the two market imperfections have opposite effects. IFs gain from lower rental prices and having more land due to imperfect competition, but lose because of higher rental prices and having less land due to transaction costs. The net effect depends on the relative size of the transaction costs. With relatively low transaction costs, the benefits from CF market power will dominate. With relatively high transaction costs (as is the case in figure 1.2), the losses due to transaction cost will dominate. The net loss for IFs is equal to area *FK*[34] (see also appendix A7).

The effect of the two market imperfections are also opposite in terms of land allocation. To illustrate this, consider the special case shown in figure 4.1. We denote t^* as the level of transaction costs for which the CF marginal cost curve ($MC_{t^*}^C$) crosses the equilibrium with perfect competition and no transaction costs (A^*, r^*). With perfect competition and transaction costs t^*, the equilibrium is ($A_{t^*}^*$, $r_{t^*}^*$), where $r_{t^*}^* < r^*$, $A_{t^*}^* > A^*$ and hence $A^T - A_{t^*}^* < A^T - A^*$. However, with imperfect competition and t^* the land allocation distortions are eliminated. The equilibrium land renting shifts to the competitive land allocation equilibrium A^*, where $A^* = A_{t^*}^M$. There are no land allocation distortions with the combination of t^* and imperfect competition.[35] Transaction costs smaller than t^* and imperfect competition would imply that the equilibrium will be to the left of the competitive equilibrium. In this case IF rent more land than the socially optimal level. With transaction

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[34] Notice that if transaction costs would be such that the marginal cost function MC_t^C would go through point (A^*, r^*) that both effects would exactly offset each other and the combined impact on IF welfare would be zero.

[35] Only the land market rent is depressed. It declines to $r_{t^*}^M$ ($r_{t^*}^M < r_{t^*}^* < r^*$).

costs larger than t^* the equilibrium is to the right of the competitive equilibrium. IF rent less land than the socially optimal level.

However, it is important to point out that, while the allocation of land with the combination of imperfections equals the optimal allocation, the total welfare effects are always negative (for a formal proof see appendix A7 part b). In figure 1.2 compared to the competitive market equilibrium (A^*, r^*), (A_t^M, r_t^M) implies losses equivalent to – *KLN* –*FGH*, where *KLN* represents the total transaction costs incurred and *FGH* the market distortions. For the special case in figure 4.1, there are no land allocation distortions. Only land market rent is affected, $r_{t^*}^M < r^*$. For this reason landowners lose relative to perfect competition and zero transaction costs equilibrium. Their loses equal to *DEFGHJK*. A part of this loses are transferred to CF, equal to area *DEFHJ*. The rest, area *GK*, are transaction costs. IF welfare is not affected. But social welfare is negatively affected: the net welfare effect is negative equal to area *GK*.

4.4. Effects of Reforms: Reduction of Transaction Costs and More Competition

Institutional and economic reforms can lead to increased competition and reduced transaction costs. For example, in European transition countries which joined the EU, the legal and institutional reforms which were required as part of the EU accession process improve the legal and institutional framework in which land transactions occur. At the same time, reforms which enhance profitability and productivity of the farms, for example through stimulating foreign investment in the processing sector, will also stimulate land transactions and thereby improve experience, transparency, and understanding of the market, all reducing transaction costs.

Productivity and total welfare increase

Imperfect competition and transaction costs t (for $t \neq t^*$) create a wedge between the marginal value products of the IFs and the CFs, i.e. $pf_A^I \neq pf_A^C$.[36] Depending on the level of t, either the marginal value product of the IFs is larger than the marginal value product of the CFs or the marginal value product of the CFs is larger than the marginal value product of the IFs.[37] In any case a more efficient land allocation can be found where land productivity is higher.

The removal of both market imperfections stimulates land transactions leading to a reallocation of land from farms with smaller marginal value products to farms with higher marginal value products, up to the point where the marginal value products are equalized. The reduction of transaction costs reduces IF rental costs and thus increases their land rental demand. At the same time, more competition reduces monopoly rents. If before the reform $pf_A^I > pf_A^C$, IF can now offer a higher rent and outcompete CF and this leads to an increase in IF renting and a reduction in CF renting. Inversely, if before the reform $pf_A^I < pf_A^C$, then more competition and less transaction costs will increase CF renting and reduce IF renting. Now CF can offer a higher rent than IF and therefore their land renting increases. The equilibrium after the reform is at the point where there are no more profitable land reallocation transactions by market participants, i.e. where $pf_A^I = pf_A^C$.[38]

How does this affect output and productivity? Land productivity before the reform is

[36] For the special case when $t=t^*$ $pf_A^I = pf_A^C$.

[37] This follows from FOC with imperfect competition and transaction costs given by equations (4) and (A7.1).

[38] For the special case when $t=t^*$ land reallocation will not take place because marginal products are equal already before reform, $pf_A^I = pf_A^C$, and no farm can offer a higher rate. The only effect will be an increase in land market rent.

$\gamma\Big|_{t>0}^{M} = \dfrac{pf^{I}\left(A^{T} - A_{t2}^{M}\right) + pf^{C}(A_{t2}^{M})}{A^{T}}$, while land productivity after the reform is

$\gamma\Big|_{t=0}^{*} = \dfrac{pf^{I}\left(A^{T} - A^{*}\right) + pf^{C}(A^{*})}{A^{T}} = \dfrac{pf^{I}\left(A^{T} - A_{t2}^{M}\right) + pf^{C}(A_{t2}^{M})}{A^{T}} + \dfrac{Q^{T}\Big|_{t=0}^{*} - Q^{T}\Big|_{t>0}^{M}}{A^{T}}$ implying that:

$$(37)\quad \gamma\Big|_{t=0}^{*} = \frac{pf^{I}\left(A^{T} - A^{*}\right) + pf^{C}(A^{*})}{A^{T}} \geq \gamma\Big|_{t>0}^{M} = \frac{pf^{I}\left(A^{T} - A_{t2}^{M}\right) + pf^{C}(A_{t2}^{M})}{A^{T}}.$$

The total output change induced by the reform is positive, $Q^{T}\Big|_{t=0}^{*} - Q^{T}\Big|_{t>0}^{M} \geq 0$[39] leading to increase of land productivity defined as $\gamma = \dfrac{pQ^{T}}{A^{T}}$.

The output effect is shown in figure 4.2 With transaction costs t_2 (where $t_2 > t^*$) IF output gain is given by area *MNOPQR* while CF output loss is given by area *OPQR*. As a result, total output increases by area *MN*. With transaction costs t_0 (where $t_0 < t^*$) the total output increases by area *FG* as CF output increases by area *FGHJKL* while IF output decreases by area *HJKL*.[40]

But there are important distributional effects

The reform that simultaneously removes transaction costs and eliminates imperfect competition has significant income implications for the farms and landowners. Most obviously, reforms which eliminate CF market power reduces CF profits.[41] At the same time the removal of transaction costs increases land competition from IF leading to an increase in the market rent and further decreasing CF profits. This is illustrated in figure 4.2. The

[39] This follows from the reverse of the proof shown in appendix A7 part b.

[40] With fixed land supply land productivity also increases.

[41] This follows from the proof shown in appendix A7 part b. Because CF gained from market imperfections, then they must lose from removing them.

equilibrium before the reform is (A_{t2}^M, r_{t2}^M) for transaction costs t_2. The reform shifts the equilibrium to (A^*, r^*) and CF pay a higher rent ($r^*>r_{t2}^M$) and rent less land ($A^* < A_{t2}^M$). Their profits are reduced by area *DEGHJKOPQ*.

Both the removal of transaction costs and the elimination of imperfect competition increase market rent. As a result, landowners gain from the reform.[42] The rent, as shown in figure 4.2 for transaction costs t_2, increases from r_{t2}^M to r^*. The landowners gains are equal to area *DEGHJKOPQNUVY*.

The effect of the reform on IF depends on the size of initial transaction costs.[43] First, consider the case when initial transaction costs equal t_2, where $t_2>t^*$ (figure 4.2). Reforms which reduce transaction costs t_2 to zero and impose perfect competition create gains to IF. Without transaction costs the IF rental costs decrease. They can offer higher rent and rent more land. On the other hand, competition decreases IF land renting and increases the rent, because with the elimination of imperfect competition CF no longer push down land rent to maximize profits. The transaction costs effect is stronger than the market imperfection effect. In equilibrium IF use more land after the reform (A^T - A^* > A^T - A_{t2}^M), and their rental costs decrease ($r^* < r_{t2}^M+t_2$) leading to net gains for IF equal to area *MS*.

However, if initial transaction costs are lower then t^*, such as with t_0 in figure 4.2 where $t_0 < t^*$, IF lose with reforms. The equilibrium with imperfect competition and transaction costs t_0 is (A_{t0}^M, r_{t0}^M). Now after the reform the first effect (the transaction costs effect) is smaller than the second effect (the market imperfection effect). In equilibrium IF land renting declines (A^T - $A^* < A^T$ - A_{t0}^M) and the IF rental costs rise ($r^*>r_{t0}^M+t_0$). As a result, IF lose area *HONU*.

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[42] This follows from the proof shown in appendix A7 part b. Because landowners lost from market imperfections, then they must gain from removing them.

[43] This follows from the proof shown in appendix A7 part b. If IF lost from market imperfections, then they must gain from removing them. If IF gain from market imperfections, then they must lose from removing them.

4.5. The Effect of Partial Reform (Reduction of Transaction Costs but Imperfect Competition)

In reality, transaction costs seem to be falling in many countries. In contrast, large corporate farms persist and continue to dominate the land market (table 1.1). In fact, in several countries a re-concentration has occurred recently. For example in Russia and Kazakhstan huge farming companies, often using more than 100,000 hectares of land have emerged since 1998 (Swinnen, 2005). The welfare and output effects can be quite different in this situation compared to the reform effects analyzed in the previous section.

Productivity and welfare may increase or may decrease with partial reform

The output and welfare effect of partial reform depend on the size of initial transaction costs. To show this, assume first that initial transaction costs are smaller than t^*. To earn monopoly profits, CF push the land market rent down by reducing renting. This shifts the renting equilibrium to (A^M, r^M) (figure 4.1). In equilibrium CF rent less land than the socially optimal level. However, transaction costs increase CF renting. Transaction costs smaller than or equal to t^* shift the CF renting closer to (A^*, r^*). In the special case when transaction costs are equal to t^* then the equilibrium is $(A_{t^*}^M, r_{t^*}^M)$, where $A^* = A_{t^*}^M$.

In this case, a reform which reduces transaction costs but which keeps imperfect competition unchanged moves the land allocation equilibrium away from the efficient land allocation, (A^*, r^*). IF can rent more land with reduced transaction costs because their rental costs decline with the reform. However, CF still affect the land market rent. They adjust their renting: to earn monopoly profits they decrease renting because of stronger competition from IF. Marginally more productive CF use less land. For example, with the reduction of transaction costs from t^* to zero the equilibrium shifts from the pre-reform equilibrium $(A_{t^*}^M$,

r_{t*}^{M}), where $A_{t*}^{M} = A^{*}$, to a new equilibrium (A^{M}, r^{M}), where $A^{M} < A^{*}$ (figure 4.1). Hence, with partial reform a new less efficient land allocation is achieved.

Figure 4.1 illustrates the effects. CF production declines by area *BEFJL*. IF use more land so their production increases by area *FJL*. The total production effect is output loss equal to area *BE*.[44] Area *BE* is actually a monopoly loss caused by a distortion of the monopolistic behavior of CF with transaction costs zero. This monopoly loss is the maximum possible output loss of restructuring. On the other hand, because transaction costs are reduced to zero, positive welfare gains are realized equal to area *GK*. The transaction costs gains, area *GK*, plus the output loss, area *BE*, implies that the direction of change of total welfare could be negative or positive depending on which area is larger. (This result is formally derived in appendix A8 part a).

Now consider the alternative case that initial transaction costs t_2 are larger than t^{*} ($t_2 > t^{*}$). The equilibrium with t_2 and imperfect competition is given by (A_{t2}^{M}, r_{t2}^{M}). This is shown in figure 4.3. The reform that reduces transaction costs by $\Delta t = |t^{*} - t_2|$ or by a smaller amount but keeps imperfect competition shifts the land allocation equilibrium closer to the competitive land allocation equilibrium (A^{*}), and the restructuring will be accompanied with output increase. For example, the reduction of transaction costs t_2 to t_1 ($t^{*} < t_1 < t_2$) shifts the equilibrium to (A_{t1}^{M}, r_{t1}^{M}). The restructuring results in reallocation of land from less to more efficient users. The CF renting declines while renting of IF increases. CF produce less by area *FGH*, and IF produce more by area *DEFGH*. The total production effect is output gain equal to area *DE*. Because of the reduction of transaction costs there is a welfare gain equal to area *KL*. However, IF use more land by $A_{t2}^{M} - A_{t1}^{M}$. For this land transaction costs are incurred because the land must be withdrawn from the CF. These losses equal area *EF*. Hence, the

[44] Land productivity declines too, see appendix A8 part b.

total net welfare effect is equal to the output effect (gain in area *DE*) plus the transaction costs effect (gain in area *KL* minus loss in area *EF*), i.e. area *DKL* – *F*.

With further reduction of transaction costs (for $\Delta t > | t^* - t_2 |$), the effect on productivity is ambiguous. The land allocation equilibrium moves beyond the competitive land allocation equilibrium (A^*). Consider the case when transaction costs t_2 are reduced to zero. This is shown in figure 4.5. The total output effect can be split in two parts. First, the reduction of transaction costs to t^* results in output gains equal to area *C*. Second, for the reduction of transaction costs from t^* to zero ($\Delta t = | 0 - t^* |$) the output effect is negative and is equivalent to area *B* in figure 4.5 (which is equal to area *BE* in figure 4.1).

The combined output effect of transaction costs reduction from t_2 to zero, is output change equal to area *C* – *B* (figure 4.5). The sign of the net total output effect depends on the magnitudes of the two areas[45] (see appendix A8 part a for a formal derivation).

The total welfare effect is equal to the output effect (area *C* – *B*) plus the transaction costs gains (area *DK*) (figure 4.5). The net effect on welfare with partial reform can be positive or negative (see also appendix A8 part a).

In summary, we have shown that the effect of partial reform can lead to welfare gains or losses. The later may result because removing one imperfection while keeping the other one may cause an inefficient allocation of resources. Removing transaction costs increases total welfare. However, if the market power of CF is maintained, this leads to a misallocation of land resources and the total effect of reform may result in lower welfare and land productivity.

CF lose, while IF and landowners gain from partial reform

Partial reform, which removes transaction costs but keeps imperfect competition, also has important income distributional effects. Beneficiaries are IF and landowners, while CF lose (see proof in appendix A7 part a). The removal of transaction costs benefit IF. Their rental costs decline and they can compete for more land. In equilibrium their renting increases and the rental costs that they pay decline. Consider transaction costs t_2 in figure 4.5. With the partial reform the equilibrium shifts from (A_{t2}^M, r_{t2}^M) to (A^M, r^M). IF incur lower rental costs $(r^M < r^M_{t2} + t_2)$ and they rent more land $(A^T - A^M > A^T - A_{t2}^M)$ Their profits increase by area *CDEF*.

CF lose from the partial reform. With the reduction of transaction costs, land withdrawal is cheaper for IF. In equilibrium CF renting is lower and the rent they pay is higher. In the case shown in figure 4.5 after the reform the CF rent increases from r_{t2}^M to r^M, while CF renting declines from A_{t2}^M to A^M. CF losses equal area *BEFGHJ*.

Landowners gain. Stronger competition between IF and CF due to reduced transaction costs pushes the market rent up. The rent increases from r_{t2}^M to r^M and the landowners' gains equal area *GHJK*.

[45] The same holds for land productivity. See appendix A8 part b.

4.6. Factors Affecting the Impacts: Land Demand Elasticities and Relative Farm Productivity

As shown above, with partial reform, the reduction of transaction costs may increase output (such as area *DE* in figure 4.4 for the reduction of transaction costs from t_2 to t^*), while other reductions in transaction costs may reduce output (such as area *BE* in figure 4.1 for the reduction of transaction costs from t^* to 0). The total welfare change is crucially dependent on the sizes of these output effects, because the total welfare change additionally to gains obtained from transaction costs reduction also depends on the output change.

As discussed above, one important factor that affects the size of these output effects is the level of transaction costs. Two other relevant factors are land demand elasticities and relative farm productivity.

Land Demand Elasticities

Land demand elasticity measures the size of the adjustment in farms' land rental demand when land rent changes. If CF land demand elasticity is high any land rent adjustment induces large changes in CF land renting, while if CF land elasticity is small any land rent adjustment induces small changes in CF land renting. In other words, with small land demand elasticity the CF land marginal product value (or the rent that CF is willing offer to landowners) changes greatly with respect to a change in land renting. The reverse holds for high elasticity.

When the CF has market power it adjust land renting to equalize its land marginal value product with marginal costs (equation (6)) and not with the market rent as in the case of perfect competition (equation (A7.14)). With high (low) CF elasticity the land adjustment from the competitive equilibrium to imperfect competition equilibrium is higher (smaller).

This implies high land allocation distortions with high CF land demand elasticity and small land allocation distortions with small CF land demand elasticity. As shown in figure 4.1 the partial reform that removes transaction costs t^* shifts the equilibrium from ($A_{t^*}^M$, $r_{t^*}^M$) to (A^M, r^M). The land allocation distortions that arises because of CF market power is, equal to $A^* - A^M$ and increases with CF land demand elasticity. This implies that the output loss of the partial reform, given by area *BE*, also increases with the CF elasticity.[46] Similarly, when there is an output gain (such as area *DE* in figure 4.4 for the reduction of transaction costs from t_2 to t^*) with partial reform, everything else equal, the higher the CF elasticity, the higher the output gain.[47]

The IF land demand elasticity also affects the outcomes. The potential output loss that a partial reform can induce decreases with the IF elasticity. If partial reform reduces transaction costs t^* to zero but keeps imperfect competition, the land allocation equilibrium shifts from A^* to A^M (figure 4.1). The smaller the IF elasticity is, the higher land allocation distortion are, and A^M is moved further away from A^*. This implies a higher output loss as

[46] Assume land demands of IF and CF to be linear (this demands will be used in the simulation model, see further):

(38) $$r + t = b + cA^I$$

(39) $$r = d + fA^C$$

where $c, f < 0$. Then the output loss of the partial reform, given by area *BE* in figure 4.1 is as follows:

(40) $$\text{Area } BE = -\frac{(c+f)}{2}\left[\frac{c(b-d+cA^T)}{(f+2c)(f+c)}\right]^2.$$

From equation (40) it can be shown that output loss of the partial reform, given by area *BE* in figure 4.1, increases with CF demand elasticity (η^C), where $\eta^C = \frac{d}{fA^C} + 1$, and decreases with IF demand elasticity (η^I), where $\eta^I = \frac{b}{cA^I} + 1$.

[47] From equations (38) and (39) the output gain of the partial reform, given by area *DE* in figure 4.4 can be calculated as follows:

(41) $$\text{Area } DE = -\frac{(c+f)}{2}\left[\frac{t(f+c)+c(b-d+cA^T)}{(f+2c)(f+c)}\right]^2.$$

From equation (40) it can be shown that output gain of the partial reform, given by area *DE* in figure 4.4, increases with CF and IF demand elasticities.

given by area *BE*. Similarly, (potential) output gains of partial reform increase with the IF elasticity. For example if transaction costs t_2 are reduced to t^* the land allocation with partial reform shifts from A_{t2}^M to A^* (figure 4.4). Land allocation distortions decrease with IF elasticity. This implies that with high IF elasticity the land allocation equilibrium with imperfect competition and t_2, A_{t2}^M, is closer to the equilibrium with perfect competition and t_2, A_{t2}^*, but further away from the equilibrium without market imperfections A^*. This implies that the output gain given by area *DE* increases with IF elasticity.

Figures 4.6 and 4.7 illustrate the impact of elasticities on output changes with reforms based on simulation results.[48] Figure 4.6 shows the output loss (such as given by area *BE* in figure 4.1 with the reduction of t^* to 0 with partial reform) for different IF and CF land demand elasticities. Everything else equal, the output losses increase with the CF land demand elasticity and decreases with the IF land demand elasticity. Figure 4.7 shows simulation results for output gains with partial reform (such as given by area *DE* in figure 4.4 for the reduction of transaction costs from t_2 to t^*). The output gains are larger with larger CF and IF elasticities.

In summary, it is more likely that partial reform leads to net output loss and hence to total welfare loss when the IF elasticity is small. CF market power causes larger land allocation distortions with smaller IF demand elasticity. Hence, the output loss which can arise from partial reform increases, while the output gain decreases with smaller IF elasticity. In the case of CF elasticity, the pattern in total output change and total welfare change is not clear, because both output loss and output gain that can arise from a partial reform move in the same direction with the CF land demand elasticity.

Relative Farm Productivity

Another factor that affects the outcome is the relative productivity of the farms. This is shown in figure 4.8. Assume initial CF demand as given by D_1^C. The equilibrium with transaction costs t and imperfect competition is (A_{1t}^M, r_{1t}^M). If CF productivity increases, its land demand shifts upwards.[49] The CF demand shifts from D_1^C to D_2^C and the equilibrium shifts to (A_{2t}^M, r_{2t}^M). CF rent more land in equilibrium, $A_{2t}^M > A_{1t}^M$. With low CF productivity the reform shifts the equilibrium from (A_{1t}^M, r_{1t}^M) to (A_1^M, r_1^M), while with higher CF land productivity the reform shifts the equilibrium from (A_{2t}^M, r_{2t}^M) to (A_2^M, r_2^M). Distortions in land allocation are smaller in the former case than in the latter case: $A_1^* - A_1^M < A_2^* - A_2^M$. The reform then induces higher output loss the more productive CF are.[50] In figure 4.8 this output loss is given by areas B_1 and B_2, respectively for low and high CF relative productivity. It is clear that where area B_2 is larger than area B_1.

[48] The simulations are not based on real data from a transition country. The CF and IF land demands are assumed to be linear. Total agricultural land is assumed to be equal to 100 hectares and transaction costs are assumed to be constant ($\partial t / \partial A^I = 0$).

[49] Higher CF productivity implies that CF can produce more from the same input. Total production increases for any amount of land they rent. This implies that for any area they rent, say A^T $pf_2^C\left(A^T\right) > pf_1^C\left(A^T\right)$, where f_2^C represents production function with higher productivity as compared to production function f_1^C. Define relative farm productivity as the ratio of CF and IF land productivity with A^T, $\frac{pf^C\left(A^T\right)/A^T}{pf^I\left(A^T\right)/A^T} = \frac{pf^C\left(A^T\right)}{pf^I\left(A^T\right)}$. Every thing else equal, the CF productivity relative to IF is higher with $pf_2^C\left(A^T\right)$ than with $pf_1^C\left(A^T\right)$: $\frac{pf_2^C\left(A^T\right)}{pf^I\left(A^T\right)} > \frac{pf_1^C\left(A^T\right)}{pf^I\left(A^T\right)}$.

[50] In monopsony, CF equalize the land marginal value product with marginal cost as given by equation (6). With perfect competition the optimal CF renting decision is were land marginal product value is equal to land market rent given by equation (A7.14). With higher CF productivity CF renting, A^M , increases. This implies that the second term on the right hand side of equation (6) also increases with CF productivity. Compared to perfect competition equilibrium, then with market power CF must decrease more land renting with high productivity than with low productivity in order to equal marginal value product $p\frac{\partial f^C}{\partial A^C}$ with marginal cost $r + A^M \frac{\partial r}{\partial A^C}$. This implies that land distortions increase with CF land productivity.

Inversely, similar logic applies to output gain as given by the areas *C* in figure 4.8. The output gain is lower with higher CF productivity. This output gain occurs if initial transaction costs t, larger than t^* ($t>t^*$), are reduced to t^*. With higher CF productivity the land allocation distortions are smaller and hence smaller output gains are obtained from the reform which reduces the transaction costs t to t^*.

There are also gains in reduced transaction costs. These gains decrease with CF productivity. With low relative CF productivity, transaction costs gains equal area *EF*, while with higher CF efficiency, transaction costs gains equal area *DF*, where area *EF* > area *DF*.

Figure 4.9 summarizes simulations results for these effects. The horizontal axis shows relative CF productivity. The vertical axis shows the three effects as graphically shown in figure 4.8 (area *B*, area *C* and transaction costs gains as shown in figure 4.8) and the net welfare effect (net welfare = area *C* + transaction costs gains - area *B*). All results are represented as the share of total production. For high CF relative productivity welfare losses tend to dominate, while for low CF productivity welfare gains tend to dominate.[51]

In summary, it is more likely that partial reform will cause net output loss and hence net welfare loss the higher CF land productivity is relative to IF. This is because land allocation distortions are more likely to increase after the partial reform the higher CF relative land productivity is.

[51] In reality one may expect that CF productivity relative to IF is not so high. There is large literature arguing that large CF are inefficient relative to IF due to labour monitoring problem (e.g. Pollak, 1985; Schmitt, 1991). If this holds then one may expect that the overall welfare effect of partial reform is positive.

4.7. Conclusions

This chapter used a model with transaction costs and imperfect competition in the land market to analyze the efficiency and welfare effects of reforms which reduce transaction costs as large farms continue to dominate the land market. The implications are important. The results show that the continuation of imperfect competition mitigates efficiency gains and welfare benefits that would otherwise result from reforms that reduce transaction costs. In extreme cases, partial reforms can actually lead to welfare losses. Removing one imperfection while keeping the other one may cause an inefficient allocation of resources. When removing transaction costs, total welfare increases. However, if market power of CF is maintained, this leads to a misallocation of land resources and the total effect of reform may result in lower welfare and land productivity. These welfare effects are strongly affected by the size of transaction costs, relative farm productivity and farm land demand elasticities.

Partial reforms also have important income distribution effects. IF gain because their rental costs decline due to a reduction in transaction costs. CF lose because of higher rents and stronger competition from IF. Higher land market rents lead to gains to landowners.

The early literature on collective action shows that wealth inequality may be required to create incentives for the provision of common goods (reforms) (Olson, 1965). Based on this argument, the literature on collective action implies lower incentives for reforms in transition countries. Imperfect competition and transaction costs may cause positive or negative externalities depending on whether they concern CF, IF or landowners. Landowners loose from both types of market imperfections. In many transition countries landownership is fragmented. Based on this early literature on collective action and land inequality, the incentives of landowners to cooperate in collective action which would reduce transaction costs and imperfect competition is limited. This is because in the case of fragmented landownership gains to an individual landowner are small compared to the costs of such an action. On the other hand, CF gain from both types of market imperfections. CF have higher incentives to act resulting in the same or higher market imperfections because large CF gain a significant proportion of the total benefit from the reforms. IF gain from imperfect competition, while they loose from transaction costs. Similar to landowners, their incentives to cooperate in a collective action are small. However, the recent literature has stressed negative impact of increased wealth inequality on the provision of common goods (e.g. Baland and Platteau, 1997; La Ferrara, 2002; Bardhan, Ghatak, and Karaivanov, 2007; Olper, 2007). Additionally, political economy factors may affect the equilibrium level of reforms (e.g. Pecorino 1998; Swinnen, 1999; Magee, 2002; Dutt and Mitra, 2005; Olper, 2007). These factors complicate predictions of reform implementation in transition countries.

Appendix

A1. Proof of Proposition 1.

Part 1: To show: $\frac{d\Pi^I}{ds}=0$, $\frac{d\Pi^C}{ds}=0$ and $\frac{d\Pi^L}{ds}>0$ without transaction costs and perfect competition. In this case, total profits of IF, CF and landowners, respectively, are $\Pi^I = pf^I(A^I)-(r-s)A^I$, $\Pi^C = pf^C(A^C)-(r-s)A^C$, and $\Pi^L = rA^T$.

Then we must show that:

(A1.1) $\frac{d\Pi^I}{ds} = -A^I\frac{dr}{ds}+A^I = 0$

(A1.2) $\frac{d\Pi^C}{ds} = -A^C\frac{dr}{ds}+A^C = 0$

(A1.3) $\frac{d\Pi^L}{ds} = r\frac{dA^T}{ds}+A^T\frac{dr}{ds} > 0$

With $\frac{dA^T}{ds}=0$, (A1.1 - A1.3) can only hold if $\frac{dr}{ds}=1$.

In equilibrium the following conditions must be satisfied (with $\frac{\partial f^I(A^I)}{\partial A^I}=f_A^I$ and $\frac{\partial f^C(A^C)}{\partial A^C}=f_A^C$):

(A1.4) $pf_A^I = r-s$ First order condition of a representative IF

(A1.5) $pf_A^C = r-s$ CF' first order condition

(A1.6) $A^T = A^I + A^C$ Land equilibrium condition

Totally differentiating equations (A1.4 – A1.6) yields:

(A1.7) $pf_{AA}^I dA^I = dr - ds$

(A1.8) $pf_{AA}^C dA^C = dr - ds$

(A1.9) $dA^I + dA^C = 0$

Using (A1.7 – A1.9), it follows that:

(A1.10) $\dfrac{dr}{ds} = \dfrac{pf_{AA}^C + pf_{AA}^I}{pf_{AA}^C + pf_{AA}^I} = 1$

Q.E.D of part 1.

Part 2: To show: $\dfrac{d\Pi^I}{ds} = 0$, $\dfrac{d\Pi^C}{ds} = 0$ and $\dfrac{d\Pi^L}{ds} > 0$ with transaction costs and imperfect competition. Now the total profit of IF is defined by equation $\prod^I = pf^I(A^I) - (r + t - s)A^I$.

For CF and landowners total profits are defined as in part 1. Then we must show that:

(A1.11) $$\frac{d\prod^I}{ds} = -A^I \frac{dr}{ds} - A^I t_A \frac{dA^I}{ds} + A^I = 0$$

(A1.12) $$\frac{d\prod^C}{ds} = pf_A^C \frac{dA^C}{ds} - (r - s)\frac{dA^C}{ds} - A^C \frac{dr}{ds} + A^C = 0$$

as well as (A1.3).

Where $t(A^I)$ allows for increasing unit transaction costs ($\dfrac{\partial t}{\partial A^I} = t_A \geq 0$).

(A1.11) (A1.12) and (A1.3) hold if $\dfrac{dA^I}{ds} = \dfrac{dA^C}{ds} = 0$ and $\dfrac{dr}{ds} = 1$.

With imperfect competition and transaction costs, the conditions (A1.6) must be satisfied, as well as:

(A1.13) $pf_A^I = r + t - s$ First order condition of a representative IF

(A1.14) $pf_A^C = r - s + A^C \dfrac{\partial r}{\partial A^C}$ CF' first order condition

From (1.13) and (A1.6) $\dfrac{\partial r}{\partial A^C}$ can be obtained:

(A1.15) $\dfrac{\partial r}{\partial A^C} = -pf_{AA}^I + t_A$

Totally differentiating equations (A1.6) (1.13) and (A1.14) and using equation (A1.15) (with $\frac{\partial^2 t(A^I)}{\partial {A^I}^2} = t_{AA}$, $\frac{\partial^3 f^I(A^I)}{\partial {A^I}^3} = f^I_{AAA}$) yields (A1.9), as well as:

(A1.16) $pf^I_{AA} dA^I = dr + t_A dA^I - ds$

(A1.17) $\left(pf^C_{AA} + pf^I_{AA} - t_A\right)dA^C + \left(A^C pf^I_{AAA} - A^C t_{AA}\right)dA^I = dr - ds$

Using (A1.9), (A1.16) and (A1.17), it follows that:

(A1.18) $\frac{dA^C}{ds} = \frac{dA^I}{ds} = \frac{1-1}{-pf^C_{AA} - 2pf^I_{AA} + 2t_A + A^C\left(pf^I_{AAA} - t_{AA}\right)} = 0$

(A1.19) $\frac{dr}{ds} = \frac{-pf^C_{AA} - 2pf^I_{AA} + 2t_A + A^C\left(pf^I_{AAA} - t_{AA}\right)}{-pf^C_{AA} - 2pf^I_{AA} + 2t_A + A^C\left(pf^I_{AAA} - t_{AA}\right)} = 1$

Q.E.D.

A2. Proof of Proposition 2

To show: $\frac{d\Pi^I}{ds} < 0$, $\frac{d\Pi^C}{ds} > 0$ and $\frac{d\Pi^L}{ds} > 0$, if $s^I = \alpha s$ and $0 < \alpha < 1$.

A2.1. Perfect competition and no transaction costs

In equilibrium the conditions (A1.5) and (A1.6) must be satisfied, as well as:

(A2.1.1) $pf^I_A = r - \alpha s$

Totally differentiating equations (A1.5), (A1.6) and (A2.1.1) yields (A1.8) and (A1.9) as well as:

(A2.1.2) $pf^I_{AA} dA^I = dr - \alpha ds$

Solving (A1.8), (A1.9) and (A2.1.2) it follows that:

(A2.1.3) $\frac{dA^I}{ds} = \frac{1-\alpha}{pf^C_{AA} + pf^I_{AA}} < 0$

The denominator is negative with $f^C_{AA} < 0$ and $f^I_{AA} < 0$, implying a decline of land used by IF.

The effect of unequal subsidies on land market rent is:

(A2.1.4) $\frac{dr}{ds} = \frac{pf_{AA}^{I} + \alpha pf_{AA}^{C}}{pf_{AA}^{C} + pf_{AA}^{I}}$ and $0 < \frac{dr}{ds} < 1$.

Using these results it follows that:

(A2.1.5) $\frac{d\prod^{I}}{ds} = \frac{-A^{I} pf_{AA}^{I}(1-\alpha)}{pf_{AA}^{C} + pf_{AA}^{I}} < 0$

(A2.1.6) $\frac{d\prod^{C}}{ds} = \frac{A^{C} pf_{AA}^{C}(1-\alpha)}{pf_{AA}^{C} + pf_{AA}^{I}} > 0$

(A2.1.7) $\frac{d\prod^{L}}{ds} = \frac{A^{T}\left(pf_{AA}^{I} + \alpha pf_{AA}^{C}\right)}{pf_{AA}^{C} + pf_{AA}^{I}} > 0$

Landowners and CF gain while IF lose with unequal subsidies.

Q.E.D.

A2.2. Imperfect competition and transaction costs

Now conditions (A1.6) and (A1.14) must be satisfied, as well as:

(A2.2.1) $pf_{A}^{I} = r + t(A^{I}) - \alpha s$

Totally differentiating equations (A1.6), (A1.14) and (A2.2.1) and using equation (A1.15) yields (A1.9) and (A1.17), as well as:

(A2.2.2) $pf_{AA}^{I} dA^{I} = dr + t_{A} dA^{I} - \alpha ds$

Using (A1.9), (A1.17) and (A2.2.2) it follows that:

(A2.2.3) $\frac{dA^{I}}{ds} = \frac{-(1-\alpha)}{-pf_{AA}^{C} - 2pf_{AA}^{I} + 2t_{A} + A^{C} pf_{AAA}^{I} - A^{C} t_{AA}} < 0$

(A2.2.4) $\frac{dr}{ds} = \frac{-(1+\alpha)pf_{AA}^{I} + (1+\alpha)t_{A} + \alpha\left(-pf_{AA}^{C} + A^{C} pf_{AAA}^{I} - A^{C} t_{AA}\right)}{-pf_{AA}^{C} - 2pf_{AA}^{I} + 2t_{A} + A^{C} pf_{AAA}^{I} - A^{C} t_{AA}} > 0$

The necessary condition for a maximum for the CF profit function is that its second derivative must be negative ($\frac{\partial^2 \Pi^C}{\partial A^{C2}} < 0$):

(A2.2.5) $-pf_{AA}^C - 2pf_{AA}^I + 2t_A + A^C pf_{AAA}^I - A^C t_{AA} > 0$

This implies that the denominators in equations (A2.2.3) and (A2.2.4) as well as the numerator in (A2.2.4) are positive. Hence, unequal subsidies lead to a decrease of land used by individual farmers and to an increase of the land rent.

Calculating the effect of unequal subsidies on profits, yields:

(A2.2.6) $$\frac{d\Pi^I}{ds} = \frac{A^I pf_{AA}^I (1-\alpha)}{-pf_{AA}^C - 2pf_{AA}^I + 2t_A + A^C pf_{AAA}^I - A^C t_{AA}} < 0$$

(A2.2.7) $$\frac{d\Pi^C}{ds} = \frac{\left[-pf_{AA}^C - 2pf_{AA}^I + 2t_A + A^C pf_{AAA}^I - A^C t_{AA}\right] A^C (1-\alpha)}{-pf_{AA}^C - 2pf_{AA}^I + 2t_A + A^C pf_{AAA}^I - A^C t_{AA}} > 0$$

(A2.2.8) $$\frac{d\Pi^L}{ds} = \frac{A^T \left[(1+\alpha)t_A - (1+\alpha)pf_{AA}^I + \alpha\left(-pf_{AA}^C + A^C pf_{AAA}^I - A^C t_{AA}\right)\right]}{-pf_{AA}^C - 2pf_{AA}^I + 2t_A + A^C pf_{AAA}^I - A^C t_{AA}} > 0$$

Q.E.D.

A3. Proof of Proposition 6

To show: $\frac{dr}{ds} > 1$ with $\alpha > 0$.

We show the case when farms remain credit constrained with the subsidy.[52]

With area payments the farm credit constraint is given by (36). In equilibrium condition (29) must be satisfied, as well as:

(A3.1) $pf_A + pf_K \frac{\alpha s}{k} - r + (1-\alpha)s = 0$

Totally differentiating (29) and (A3.1) yields:

[52] The case when area subsidies remove the full credit constraint can be analogously derived.

(A3.2) $MdA + Rds - dr = 0$

(A3.3) $dA = 0$

where

(A3.4) $R = \frac{\alpha A^T}{k}\left(pf_{AK} + pf_{KK}\frac{\alpha s}{k}\right) + pf_K \frac{\alpha}{k} + (1-\alpha) \geq 1$,

(A3.5) $M = \left(pf_{AA} + pf_{AK}^C \frac{\alpha s}{k} + pf_{KA}\frac{\alpha s}{k} + pf_{KK}\frac{\alpha^2 s^2}{k^2}\right) < 0$.

Solving for $\frac{dr}{ds}$ yields:

(A3.6) $\frac{dr}{ds} = \frac{\alpha A^T}{k}\left(pf_{AK} + pf_{KK}\frac{\alpha s}{k}\right) + pf_K \frac{\alpha}{k} + (1-\alpha) \geq 1$

With credit constraints it holds (a) that total farm fertilizer use is fixed and given by equation (36), i.e. $K = \frac{S + \alpha s A}{k}$ and (b) that $pf_K - k > 0$. If farms are credit constrained, when using additional fertilizer land marginal profitability must increase, $\Pi_{AK} > 0$, which implies that $\Pi_{AK} = pf_{AK} + pf_{KK}\frac{\alpha\ s}{k} > 0$. If this is not the case, then by decreasing fertilizer marginal profitability of land increases which increases farms' profits. However, this would imply that farms are not credit constrained, i.e. equation (36) is not binding and $K < \frac{S + sA}{k}$. Hence with $pf_K - k > 0$ and with $\Pi_{AK} = pf_{AK} + pf_{KK}\frac{\alpha s}{k} > 0$, it follows that:

1. if $\alpha = 0$ then $\frac{dr}{ds} = 1$,
2. if $\alpha > 0$ then $\frac{dr}{ds} > 1$.

Q.E.D.

A4. Proof of Proposition 7 and 8

Part a:

To show: $\frac{d\Pi}{ds} < 0$ with $\alpha > 0$.

We show the case when farms remain credit constrained with the subsidy.[53]

Farm profits are: $\Pi = pf(A,K) - (r-s)A - kK$. It follows that:

(A4.1) $$\frac{d\Pi}{ds} = -A^T \frac{\alpha A^T}{k}\left(pf_{AK} + pf_{KK}\frac{\alpha s}{k}\right) \leq 0$$

With $pf_{AK} + pf_{KK}\frac{\alpha\ s}{k} > 0$ (see proposition 1) it follows that $\frac{d\Pi}{ds} < 0$ if $\alpha > 0$. If $\alpha = 0$ then $\frac{d\Pi}{ds} = 0$.

Q.E.D part a.

Part b:

To show: $\frac{dW}{ds} > 0$ with $\alpha > 0$.

We consider the situation where the credit constrained farms remain credit constrained with the subsidy.[54]

Total welfare (*W*) is the sum of farm profits (Π), landowners total rents ($\Pi^L = rA^T$), and minus taxpayers costs sA^T, i.e. $W = \Pi + \Pi^L - sA^T$. The effect of subsidies on welfare is then:

(A4.2) $$\frac{dW}{ds} = \frac{d\Pi}{ds} + \frac{d\Pi^L}{ds} - A^T$$

[53] The case when area subsidies remove all credit constraints can be analogously derived.

[54] The case when area subsidies remove all credit constraints can be analogously derived.

Using (A3.6), (A4.1) and the effect of subsidies on landowners' rent: $\frac{d\Pi^L}{ds} = A^T \frac{dr}{ds}$, it follows that:

(A4.3) $\frac{dW}{ds} = A^T pf_K \frac{\alpha}{k} - A^T \alpha = \frac{\alpha A^T}{k}\left(pf_K - k\right) > 0$

Welfare increases with $\alpha > 0$, otherwise if $\alpha = 0$, $\frac{dW}{ds} = 0$.

Q.E.D.

A5. Proof of Proposition 9

We analyze the general case when both farms (farm 1 and farm 2) are and remain credit constrained (and $\alpha^1 = \alpha^2 > 0$).[55]

To show: $\frac{d\Pi^1}{ds} < 0$ and $\frac{d\Pi^2}{ds} \le 0$ or > 0 if farm 2 is more credit constrained than farm 1, (and vice versa).

Profit of farm *i* is $\Pi^i = pf^i(A^i, K^i) - (r - s)A^i - kK^i$. Then it follows that:

(A5.1) $\frac{d\Pi^i}{ds} = \frac{\alpha^i A^i}{k}\left(pf_K^i - k\right) - A^i \frac{dr}{ds} + A^i$

With area payments, farm *i*'s credit constraint is as follows:

(A5.2) $kK^i \le S^i(W^i) + \alpha^i sA^i$.

In equilibrium the following condition must be satisfied:

(A5.3) $pf_A^i + pf_K^i \frac{\alpha^i s}{k} - r + \left(1 - \alpha^i\right)s = 0$ and $\sum_{i=1}^{2} A^i = A^T$

Totally differentiating (A5.3) yields:

[55] The case when area subsidies remove all credit constraints can be analogously derived.

(A5.4) $M^{i}dA^{i} + R^{i}ds - dr = 0$ and $\sum_{i=1}^{2} dA^{i} = 0$

where

(A5.5) $$R^{i} = \frac{\alpha^{i}A^{i}}{k}\left(pf_{AK}^{i} + pf_{KK}^{i}\frac{\alpha^{i}s}{k}\right) + pf_{K}^{i}\frac{\alpha^{i}}{k} + \left(1-\alpha^{i}\right) \geq 1,$$

(A5.6) $$M^{i} = \left(pf_{AA}^{i} + pf_{AK}^{i}\frac{\alpha^{i}s}{k} + pf_{KA}^{i}\frac{\alpha^{i}s}{k} + pf_{KK}^{i}\frac{\alpha^{i^2}s^{2}}{k^{2}}\right) < 0,$$

Using (A5.4) it follows that:

(A5.7) $$\frac{dr}{ds} = \frac{R^{1}M^{2} + R^{2}M^{1}}{M^{1} + M^{2}} \geq 1$$

A necessary condition for maximum profit is that $\Pi_{AA}^{i} < 0$, implying that $M^{i} < 0$. With credit constraints it holds that $pf_{K}^{i} - k > 0$ and that $\Pi_{AK}^{i} = pf_{AK}^{i} + pf_{KK}^{i}\frac{\alpha^{i}s}{k} > 0$ [56] implying that $R^{i} \geq 1$, hence $\frac{dr}{ds} \geq 1$.

The more farm *i* is credit constrained the less fertilizers it can use, implying (a) that the higher is the increase in land marginal productivity, $pf_{AK}^{i} + pf_{KK}^{i}\frac{\alpha^{i}s}{k}$ when adding additional fertilizers, and (b) the higher is the difference between fertilizers marginal value product and fertilizers price, $pf_{K}^{i} - k$. Hence, for a given $\alpha^{i} > 0$, R^{i} is higher the more farm *i* is credit constrained.

Then it follows that for $\alpha^{1} = \alpha^{2}$: if $R^{2} > R^{1}$ (if farm 2 is more credit constrained than farm 1) then $\frac{d\Pi^{1}}{ds} < 0$, $\frac{d\Pi^{2}}{ds} \leq 0$ or > 0.

Q.E.D.

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[56] The intuition is the same as shown in the proof of proposition 1 in Appendix A1.

A6. Perfect Competition and Welfare Effect of Transaction Costs

To show: $\dfrac{d\prod^{I}}{dt} < 0$, $\dfrac{d\prod^{C}}{dt} > 0$, $\dfrac{d\prod^{L}}{dt} < 0$, $\dfrac{dW}{dt} < 0$, where $W = \prod^{I} + \prod^{C} + \prod^{L}$.

In equilibrium with perfect competition and transaction costs conditions (4) and (15) must be satisfied as well as:

(A6.1) $A^{T} = A^{I} + A^{C}$

Totally differentiating equations (4), (15) and (A6.1) yields:

(A6.2) $pf_{AA}^{I} dA^{I} = dr + dt$

(A6.3) $pf_{AA}^{C} dA^{C} = dr$

(A6.4) $dA^{I} + dA^{C} = 0$

Solving for $\dfrac{dA^{I}}{dt}$ and for $\dfrac{dr}{dt}$ yields:

(A6.5) $\dfrac{dA^{I}}{dt} = \dfrac{1}{pf_{AA}^{C} + pf_{AA}^{I}} < 0$

(A6.6) $\dfrac{dr}{dt} = \dfrac{-pf_{AA}^{C}}{pf_{AA}^{C} + pf_{AA}^{I}} < 0$

IF renting and land market rent decline with transaction costs.

Totally differentiating equations (3), $\prod^{C} = pf^{C}(A^{C}) - rA^{C}$, and $\prod^{L} = rA^{T}$ and using equations (4), (15) and (A.5.6) yields:

(A6.7) $\dfrac{d\Pi^{I}}{dt} = \dfrac{-pf_{AA}^{I} A^{I}}{pf_{AA}^{C} + pf_{AA}^{I}} < 0$

(A6.8) $\dfrac{d\Pi^{C}}{dt} = \dfrac{pf_{AA}^{C} A^{C}}{pf_{AA}^{C} + pf_{AA}^{I}} > 0$

(A6.9) $\dfrac{d\Pi^{L}}{dt} = \dfrac{-pf_{AA}^{C} A^{T}}{pf_{AA}^{C} + pf_{AA}^{I}} < 0$

(A6.10) $\dfrac{dW}{dt} = \dfrac{-pf_{AA}^{I}A^{I}}{pf_{AA}^{C} + pf_{AA}^{I}} + \dfrac{pf_{AA}^{C}A^{C}}{pf_{AA}^{C} + pf_{AA}^{I}} - \dfrac{pf_{AA}^{C}A^{T}}{pf_{AA}^{C} + pf_{AA}^{I}} = -A^{I} < 0$

IF and landowners lose while CF gains. Total welfare effect is negative.

Q.E.D.

A7. Imperfect Competition and Welfare Effect of Transaction Costs

Part a: *this part shows the effect of transaction costs on welfare and profit when there is imperfect competition.*

To show: $\dfrac{d\prod^{I}}{dt} < 0$, $\dfrac{d\prod^{C}}{dt} > 0$, $\dfrac{d\prod^{L}}{dt} < 0$, $\dfrac{dW}{dt} <> 0$.

In equilibrium with imperfect competition and with transaction costs condition (4) and (A6.1) must be satisfied, as well as:

(A7.1) $pf_{A}^{C} = r + A^{C}\dfrac{\partial r}{\partial A^{C}}$

From (4) and (A6.1.) $\dfrac{\partial r}{\partial A^{C}}$ can be derived:

(A7.2) $\dfrac{\partial r}{\partial A^{C}} = -pf_{AA}^{I}$

Define transaction costs t^{*} such that in equilibrium $pf_{A}^{I} = pf_{A}^{C}$ (or $f_{A}^{I} = f_{A}^{C}$), hence from (4), (A7.1) and (A6.1.) it follows that in equilibrium:

(A7.3) $t^{*} = A^{C}\dfrac{\partial r}{\partial A^{C}} = -pf_{AA}^{I}A^{C}$

In words, t^{*} (which is the cost that IF pay above r) exactly matches the murk-up of CF, i.e. t^{*} exactly matches the amount by which CF land marginal value product exceeds the equilibrium land market rent r.

Totally differentiating equations (4) (A6.1) and (A7.1) and using equation (A7.2) (with $\frac{\partial^3 f^I(A^I)}{\partial A^{I^3}} = f^I_{AAA}$) yields (A6.2) and (A6.4), as well as:

(A7.4) $\left(pf^C_{AA} + pf^I_{AA}\right)dA^C + A^C pf^I_{AAA} dA^I = dr$

Solving for $\frac{dA^I}{dt}$ and for $\frac{dr}{dt}$ yields:

(A7.5) $\frac{dA^I}{dt} = \frac{1}{pf^C_{AA} + 2pf^I_{AA} - A^C pf^I_{AAA}} < 0$

(A7.6) $\frac{dr}{dt} = -\frac{\left(pf^C_{AA} + pf^I_{AA} - A^C pf^I_{AAA}\right)}{\left(pf^C_{AA} + 2pf^I_{AA} - A^C pf^I_{AAA}\right)} < 0$

The necessary condition for a maximum for the CF profit function is that its second derivative must be negative ($\frac{\partial^2 \Pi^C}{\partial A^{C^2}} < 0$), hence:

(A7.7) $pf^C_{AA} + 2pf^I_{AA} - A^C pf^I_{AAA} < 0$

IF renting and market rent decreases with the increase of transaction costs.

Totally differentiating equations (3), $\Pi^C = pf^C(A^C) - rA^C$, and $\Pi^L = rA^T$ and using equations (4), (A7.1), (A7.6) and (A.6.7) yields:

(A7.8) $\frac{d\Pi^I}{dt} = \frac{-A^I\left(pf^I_{AA}\right)}{\left(pf^C_{AA} + 2pf^I_{AA} - A^C pf^I_{AAA}\right)} < 0$

(A7.9) $\frac{d\Pi^C}{dt} = A^C \frac{\left(pf^C_{AA} + 2pf^I_{AA} - A^C pf^I_{AAA}\right)}{\left(pf^C_{AA} + 2pf^I_{AA} - A^C pf^I_{AAA}\right)} = A^C > 0$

(A7.10) $\frac{d\Pi^L}{dt} = -\frac{\left(pf^C_{AA} + pf^I_{AA} - A^C pf^I_{AAA}\right)}{\left(pf^C_{AA} + 2pf^I_{AA} - A^C pf^I_{AAA}\right)} A^T < 0$

IF and landowners lose, while CF gain if transaction costs increase.

Next solving for $\frac{dW}{dt}$ yields:

(A7.11) $\dfrac{dW}{dt} = \dfrac{A^C pf^I_{AA}}{\left(pf^C_{AA} + 2pf^I_{AA} - A^C pf^I_{AAA}\right)} - A^I <> 0$

Total welfare effect is ambiguous with imperfect competition. The first term on the right hand side of equation (A7.11), $\dfrac{A^C pf^I_{AA}}{\left(pf^C_{AA} + 2pf^I_{AA} - A^C pf^I_{AAA}\right)}$, is positive. The second one, A^I, is also positive. $A^C pf^I_{AA}$ is the amount by which CF land marginal value exceeds in equilibrium the land market rent *r* (see (A7.1) and (A7.2)). With perfect competition, land marginal value equals the land market rent *r*. Hence the total welfare effect will collapse to $\dfrac{dW}{dt} = -A^I$, which is the same as given by equation (A6.10) for the perfect competition case.

Q.E.D. part a.

Part b: *this section compares profits and total welfare obtained with imperfect competition and transaction costs,* ***relative to*** *profits and total welfare obtained with perfect competition and zero transaction costs.*

To show: $W\big|^M_{t>0} < W\big|^*_{t=0}$; $\Pi^C\big|^M_{t>0} > \Pi^C\big|^*_{t=0}$; $\Pi^L\big|^M_{t>0} < \Pi^L\big|^*_{t=0}$;

for $t < t^*$ $\Pi^I\big|^M_{0<t\leq t^*} > \Pi^I\big|^*_{t=0}$;

for $t > t^*$ $\Pi^I\big|^M_{t>t^*} < \Pi^I\big|^*_{t=0}$.

In equilibrium with perfect competition and zero transaction costs condition (A6.1) must be satisfied as well as:

(A7.13) $pf^I_A = r$

(A7.14) $pf^C_A = r$

Equations (A7.13) and (A7.14) imply that in equilibrium with perfect competition and zero transaction costs $f^I_A = f^C_A$.

From equation (A7.3), from imperfect competition and transaction costs equilibrium conditions (4), (A7.1), (A6.1), and from perfect competition and zero transaction costs equilibrium conditions (A7.13), (A7.14), and (A6.1) it follows that:

I. For t such that $t = t^*$ it follows that in equilibrium with imperfect competition $pf_A^I = pf_A^C$. The same holds for perfect competition and zero transaction costs, implying $A_t^M = A^*$ and $A^T - A_t^M = A^T - A^*$, hence $pQ^T\big|_{t=t^*}^{M} = pQ^T\big|_{t=0}^{*}$, where $pQ^T = pf^I(A^I) + pf^C(A^C)$, $Q^T\big|_{t=t^*}^{M}$ is total output with imperfect competition and transaction costs $t = t^*$, and $Q^T\big|_{t=0}^{*}$ is total output with perfect competition and zero transaction costs. Because $pf_A^I = pf_A^C$ total output is maximal at the land allocation equilibrium $A_t^M = A^*$. Any land reallocation causes $pf_A^I \neq pf_A^C$ leading to output fall.

II. For any t such that $0 < t < t^*$ ($t > t^*$) it follows that in equilibrium with imperfect competition $pf_A^I < pf_A^C$ ($pf_A^I > pf_A^C$) implying $A_t^M < A^*$, $A^T - A_t^M > A^T - A^*$ ($A_t^M > A^*$, $A^T - A_t^M < A^T - A^*$), hence $pQ^T\big|_{0<t<>t^*}^{M} < pQ^T\big|_{t=0}^{*}$. Land allocation equilibrium with higher total output can be found.

III. Total transaction costs for t equal to $\left(A^T - A_t^M\right)t$.

From I, II, and III it follows that for any t, total welfare with imperfect competition and transaction costs is lower relative to total welfare with perfect competition and zero transaction costs, $W\big|_{t>0}^{M} < W\big|_{t=0}^{*}$, where $W\big|_{t=0}^{*} = pQ^T\big|_{t=0}^{*}$ and $W\big|_{t>0}^{M} = pQ^T\big|_{t>0}^{M} - \left(A^T - A_t^M\right)t$.

CF gain with imperfect competition and transaction costs relative to the perfect competition and zero transaction costs equilibrium:

First, imperfect competitive behavior of CF implies $\Pi^C\big|_{t=0}^{M} > \Pi^C\big|_{t=0}^{*}$ otherwise behaving as a dominant player in the land market is not an optimal choice for CF. Second, with imperfect competition in place transaction costs increase CF profits, $\frac{d\,\Pi^C}{dt} > 0$; this follows from equation (A7.9), hence $\Pi^C\big|_{t>0}^{M} > \Pi^C\big|_{t=0}^{M} > \Pi^C\big|_{t=0}^{*}$.

In equilibrium with imperfect competition and transaction costs, CF gain relative to the perfect competition and zero transaction costs equilibrium.

IF gains/losses

From equation (A7.3), from imperfect competition equilibrium and transaction costs conditions (4), (A7.1), (A6.1), and from perfect competition and zero transaction costs equilibrium conditions (A7.13), (A7.14), and (A6.1) it follows that:

IV. For any t such that $0 < t \le t^*$ it follows that in equilibrium with imperfect competition, $p\,f_A^I\big|_{0<t<t^*}^{M} \le pf_A^I\big|_{t=0}^{*}$ implying, $A^T - A_t^M \ge A^T - A^*$ hence $r_t^M + t \le r^*$, yielding $\Pi^I\big|_{0<t<t^*}^{M} \ge \Pi^I\big|_{t=0}^{*}$. With imperfect competition and transaction costs t, such that $0 < t \le t^*$ IF gain relative to the perfect competition and zero transaction costs equilibrium, because they have lower rental costs and rent more land.

V. For any t such that $t > t^*$ it follows that in equilibrium with imperfect competition, $pf_A^I\big|_{t>t^*}^{M} > p\,f_A^I\big|_{t=0}^{*}$ implying $A^T - A_t^M < A^T - A^*$, hence $r_t^M + t > r^*$, yielding $\Pi^I\big|_{t>t^*}^{M} < \Pi^I\big|_{t=0}^{*}$. With imperfect competition and transaction costs t, such that $t > t^*$ IF lose relative to the perfect competition and zero transaction costs equilibrium because they pay higher rental costs and rent less land.

Landowners lose with imperfect competition and transaction costs relative to the perfect competition and zero transaction costs equilibrium:

From imperfect competition equilibrium and transaction costs conditions (4)nditions (4), (A7.1), (A6.1), and from perfect competition and zero transaction costs equilibrium conditions (A7.13), (A7.14), and (A6.1) it follows that $r_t^M < r^*$, hence $\Pi^L\Big|_{t>0}^{M} < \Pi^L\Big|_{t=0}^{*}$, where $\Pi^L\Big|_{t>0}^{M} = r_t^M A^T$ and $\Pi^L\Big|_{t=0}^{*} = r^* A^T$.

Q.E.D. part b.

A8. Welfare and Land Productivity with Partial Reform

To show: Part a: $\left.\frac{dW}{dt}\right| <> 0$

Part b: $\gamma\Big|_{0<t\le t^*}^{M} > \gamma\Big|_{t=0}^{M}$ and $\gamma\Big|_{t>t^*}^{M} <> \gamma\Big|_{t=0}^{M}$

<u>Part a:</u>

With imperfect competition and transaction costs from (A7.11) it follows that $\frac{dW}{dt} <> 0$.

The total welfare effect is ambiguous.

From equations $\prod^I = pf^I(A^I) - (r+t)A^I$, $\prod^C = pf^C(A^C) - rA^C$, $\prod^L = rA^T$, $W = \prod^I + \prod^C + \prod^L$ it follows:

(A8.1) $W = pf^I(A^I) + pf^C(A^C) - tA^I = pQ^T - tA^I$

When transaction costs are altered, total welfare is affected through 1) change in total output value (pQ^T) and 2) through the change in the level transaction costs incurred (tA^I).

Totally differentiating pQ^T and dividing by dt yields:

(A8.2) $p\frac{dQ^T}{dt} = p\left(f_A^I - f_A^C\right)\frac{dA^I}{dt}$

From equation (A7.5) and from I and II in appendix A6 part b, it follows that for any *t* such that $0 < t \leq t^*$, $\frac{dA^I}{dt} < 0$ and $pf_A^I \leq pf_A^C$, respectively, hence

(A8.3) $p\frac{dQ^T}{dt}\bigg|_{0<t\leq t*}^{M} = p\left(f_A^I - f_A^C\right)\frac{dA^I}{dt} \geq 0$

Equation (A8.3) implies that:

(A8.4) $pQ^T\big|_{0<t\leq t*}^{M} > pQ^T\big|_{t=0}^{M}$

The partial reform that eliminates only transaction costs (for $0 < t \leq t^*$) causes total output decline.

Equation (A8.4) implies that the effect of the removal of transaction costs t, such that $0 < t \leq t^*$, on welfare is ambiguous:

(A8.5) $W\big|_{t=0}^{M} - W\big|_{0<t\leq t*}^{M} > 0$ if $pQ^T\big|_{0<t\leq t*}^{M} - pQ^T\big|_{t=0}^{M} < tA^I$

(A8.6) $W\big|_{t=0}^{M} - W\big|_{0<t\leq t*}^{M} < 0$ if $pQ^T\big|_{0<t\leq t*}^{M} - pQ^T\big|_{t=0}^{M} > tA^I$

The term tA^I (given by area *GK* in figure 4.1 for transaction costs t^*) represents transaction cost gains and the term $pQ^T\big|_{0<t\leq t*}^{M} - pQ^T\big|_{t=0}^{M}$ (given by area *BE* in figure 4.1 for transaction costs t^*) represents output loss resulted from the removal of transaction costs.

From equation (A7.5) and from II in appendix A6 part b, it follows that for any *t* such that $t > t^*$ $\frac{dA^I}{dt} < 0$ and $pf_A^I > pf_A^C$, respectively, hence

(A8.7) $p\frac{dQ^T}{dt}\bigg|_{t>t*}^{M} = p\left(f_A^I - f_A^C\right)\frac{dA^I}{dt} < 0$

Equation (A8.7) implies that:

(A8.8) $pQ^T\Big|_{t>t*}^{M} < pQ^T\Big|_{t=t*}^{M}$

The partial reform that elimination transaction costs *t* (for $t > t^*$) to t^* increases total output. From equation (A8.8) and from equations (A8.4) - (A8.6) it implies that the effect of the removal of transaction costs *t* (for $t > t^*$) on welfare is ambiguous:

(A8.9) $W\Big|_{t=0}^{M} - W\Big|_{t>t*}^{M} > 0$ if $pQ^T\Big|_{t=t*}^{M} - pQ^T\Big|_{t=0}^{M} < tA^I + pQ^T\Big|_{t=t*}^{M} - pQ^T\Big|_{t>t*}^{M}$

(A8.10) $W\Big|_{t=0}^{M} - W\Big|_{t>t*}^{M} < 0$ if $pQ^T\Big|_{t=t*}^{M} - pQ^T\Big|_{t=0}^{M} > tA^I + pQ^T\Big|_{t=t*}^{M} - pQ^T\Big|_{t>t*}^{M}$

The term tA^I (given by area *DK* in figure 4.5 for transaction costs t_2) represents transaction costs gains, the term $pQ^T\Big|_{t=t*}^{M} - pQ^T\Big|_{t>t*}^{M}$ (given by area *C* in figure 4.5 for transaction costs t_2) represents output gain caused by the reduction of transaction costs from *t* to t^*, and the term $pQ^T\Big|_{t=t*}^{M} - pQ^T\Big|_{t=0}^{M}$ (given by area *B* in figure 4.5 for transaction costs t_2) represents output loss caused by the reduction of transaction costs from t^* to $t = 0$

Q.E.D. part a.

<u>Part b:</u>

From equation (A8.4), it follows that for any *t* such that $t \le t^*$

(A8.11) $\gamma\Big|_{0<t\le t*}^{M} = \dfrac{pQ^T\Big|_{0<t\le t*}^{M}}{A^T} > \gamma\Big|_{t=0}^{M} = \dfrac{pQ^T\Big|_{t=0}^{M}}{A^T}$

Land productivity is larger with positive transaction costs, such that $0 < t \le t^*$, than with zero transaction costs.

From equation (A8.4) and (A8.8), it follows that for any *t* such that $t > t^*$:

(A8.12) $\gamma\Big|_{t>t*}^{M} <> \gamma\Big|_{t=0}^{M}$

Where

(A8.13) $\gamma\big|_{t>t^*}^{M} = \dfrac{pQ^T\big|_{t>t^*}^{M}}{A^T}$

(A8.14) $\gamma\big|_{t=0}^{M} = \dfrac{pQ^T\big|_{t=0}^{M}}{A^T} = \dfrac{pQ^T\big|_{t>t^*}^{M}}{A^T} + \left[\dfrac{pQ^T\big|_{t=t^*}^{M}}{A^T} - \dfrac{pQ^T\big|_{t>t^*}^{M}}{A^T}\right] + \left[\dfrac{pQ^T\big|_{t=0}^{M}}{A^T} - \dfrac{pQ^T\big|_{t=t^*}^{M}}{A^T}\right]$

Equations (A8.13) and (A8.14) imply that:

(A8.15) $\gamma\big|_{t>t^*}^{M} > \gamma\big|_{t=0}^{M}$ if $\left[\dfrac{pQ^T\big|_{t=t^*}^{M}}{A^T} - \dfrac{pQ^T\big|_{t>t^*}^{M}}{A^T}\right] < \left[\dfrac{pQ^T\big|_{t=0}^{M}}{A^T} - \dfrac{pQ^T\big|_{t=t^*}^{M}}{A^T}\right]$

(A8.15) $\gamma\big|_{t>t^*}^{M} < \gamma\big|_{t=0}^{M}$ if $\left[\dfrac{pQ^T\big|_{t=t^*}^{M}}{A^T} - \dfrac{pQ^T\big|_{t>t^*}^{M}}{A^T}\right] > \left[\dfrac{pQ^T\big|_{t=0}^{M}}{A^T} - \dfrac{pQ^T\big|_{t=t^*}^{M}}{A^T}\right]$

The term $\left[\dfrac{pQ^T\big|_{t=t^*}^{M}}{A^T} - \dfrac{pQ^T\big|_{t>t^*}^{M}}{A^T}\right]$ is land productivity gain caused by the reduction of transaction costs from t to t^*, and the absolute value of the term $\left[\dfrac{pQ^T\big|_{t=0}^{M}}{A^T} - \dfrac{pQ^T\big|_{t=t^*}^{M}}{A^T}\right]$ represents land productivity loss caused by the reduction of transaction costs from t^* to $t=0$.

The land productivity may increase or may decreases with the removal of transaction costs t, for $t > t^*$.

Q.E.D. part b.

Tables and Figures

Table 1.1. Farm structures in transition countries

	Individual farms		Corporate farms		Year
	Share in TAA (%)	Average size (ha)	Share in TAA (%)	Average size (ha)	
Albania*	96		4		1998
Bulgaria	44	1	55	861	1997
Czech Republic	28	20	72	937	2003
Hungary	59	4	41	312	2000
Poland	87	8	13		2003
Romania	55	2	45	274	2002
Slovakia	12	42	88	1185	2003
Slovenia	94		6		2000
CEECs	**59**		**41**		
Estonia	63	2	37	327	2001
Latvia	90	12	10	297	2001
Lithuania	89	4	11	483	2003
Baltic States	**81**		**19**		
Armenia	100	1			1999
Azerbaijan	9		91		1997
Belarus	12	1	88	3 130	2000
Georgia	66	1	34	100	2000
Kazakhstan	29	15	71	11 248	2000
Kyrgyzstan	23		77		1997
Moldavia	49		51		2003
Russia	14		86	5 400	2000
Tajikistan	7		93		1997
Turkmenistan	0.3		99.7		1997
Uzbekistan	4		96		1997
Ukraine	41		59		2004
CIS	**30**		**77**		

Sources: Bulgaria: Bulgarian Ministry of Agriculture and Forestry; Czech Republic: Czech Statistical Office; Estonia: Statistical Office of Estonia; Hungary: European Commission; Poland: Central Statistical Office; Latvia: Statistical Office of Latvia; Lithuania: Statistical Office of Lithuania; Slovenia: Statistical Office of the Republic of Slovenia; Moldova: Lerman and Sutton (2006); Russia: Koester (2003); Ukraine: Lerman and Sedik . 2007; Armenia, Belarus, Georgia, Kazakhstan: FAO (2002); Azerbaijan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan: Lerman, Csaki, and Feder (2002); Albania: Albanian Ministry of Agriculture; Slovakia: Ministry of Agriculture; Romania: Romanian National Institute of Statistics.

Notes:
TAA – Total Agricultural Area
* for arable land only

Table 1.2. Land rents in the Czech Republic and Slovakia

(the value of rents are in local currencies)

	Individual farms A	*Corporate farms B*	*IF Mark-Up A/B (%)*
Czech Republic			
Average 1999	718	346	208
by region			
Corn growing region	1330	597	223
Sugar beet growing region	846	731	116
Potato growing region	447	174	257
Potato-oats growing region	761	158	482
Mountain growing region	205	68	301
Average 2003	875	660	133
Average 2004	944	759	124
Slovakia			
2001	795	242	329
2002	816	333	245
2003	732	393	186
2004	845	498	170
2005	923	638	145

Source: Czech Ministry of Agriculture; Research Institute of Agricultural Economics.

Table 3.1. Simulation results

Model	α	β1	Non-land input supply elasticity	Land supply elasticity	Output demand elasticity	Surplus change as a share of subsidy expenditure [$X/(s*A^T)$] (%)				
						Farms	Non-land input suppliers	Landowners	Consumers	Welfare gain
1	0.5	0.1	∞	0	-∞	-12	0	178	0	67
2	0.5	0.1	1.5	0	-∞	-53	20	173	0	40
3	0.5	0.1	0.5	0	-∞	-81	33	170	0	22
4	0.5	0.1	∞	0	-0.7	-160	0	161	165	66
5	0.5	0.1	∞	0	-0.3	-355	0	138	381	65
6	0.5	0.1	∞	0.1	-∞	1	0	163	0	66
7	0.5	0.1	∞	0.2	-∞	13	0	151	0	65
8	0	0.1	∞	0	-∞	0	0	100	0	0
9	0.75	0.1	∞	0	-∞	-18	0	217	0	100
10	0.50	0.2	∞	0	-∞	-24	0	190	0	67

Source: own calculations

Table 3.2. Farm household surplus change (as share of subsidy expenditures) under different assumptions of household land ownership

Model	α	β1	Non-land input supply elasticity	Land supply elasticity	Output demand elasticity	Change in farm household surplus with different share of farm land ownership		
						25%	50%	75%
1	0.5	0.1	∞	0	-∞	32	77	121
2	0.5	0.1	1.5	0	-∞	-10	33	77
3	0.5	0.1	0.5	0	-∞	-39	4	46
4	0.5	0.1	∞	0	-0.7	-120	-80	-40
5	0.5	0.1	∞	0	-0.3	-320	-286	-251
6	0.5	0.1	∞	0.1	-∞	42	83	124
7	0.5	0.1	∞	0.2	-∞	51	88	126
8	0	0.1	∞	0	-∞	25	50	75
9	0.75	0.1	∞	0	-∞	36	90	145
10	0.50	0.2	∞	0	-∞	23	71	118

Source: own calculations

Figure 1.1. Equilibria in the land market with transaction costs

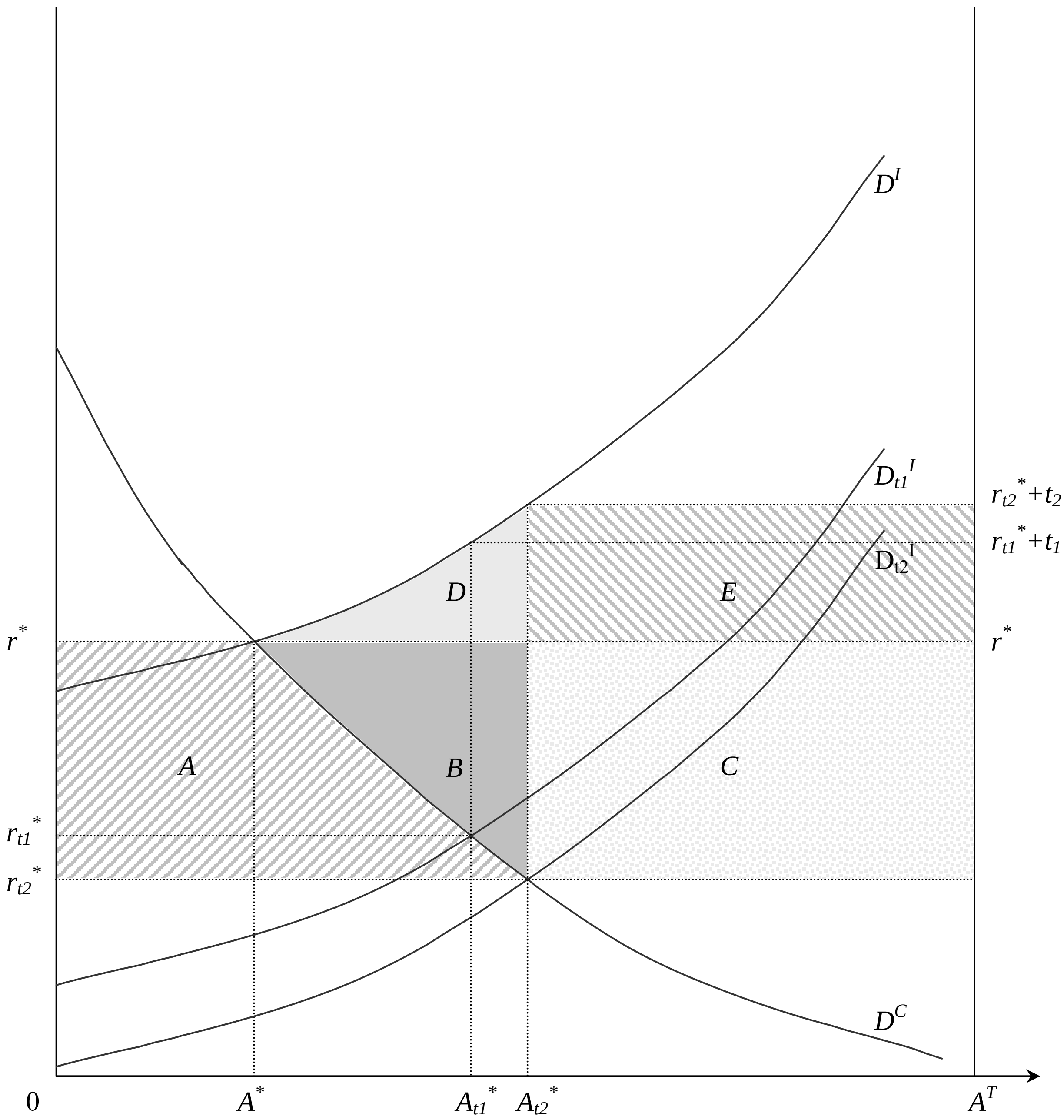


Figure 1.2. Effect of imperfect competition and transaction costs in the land market

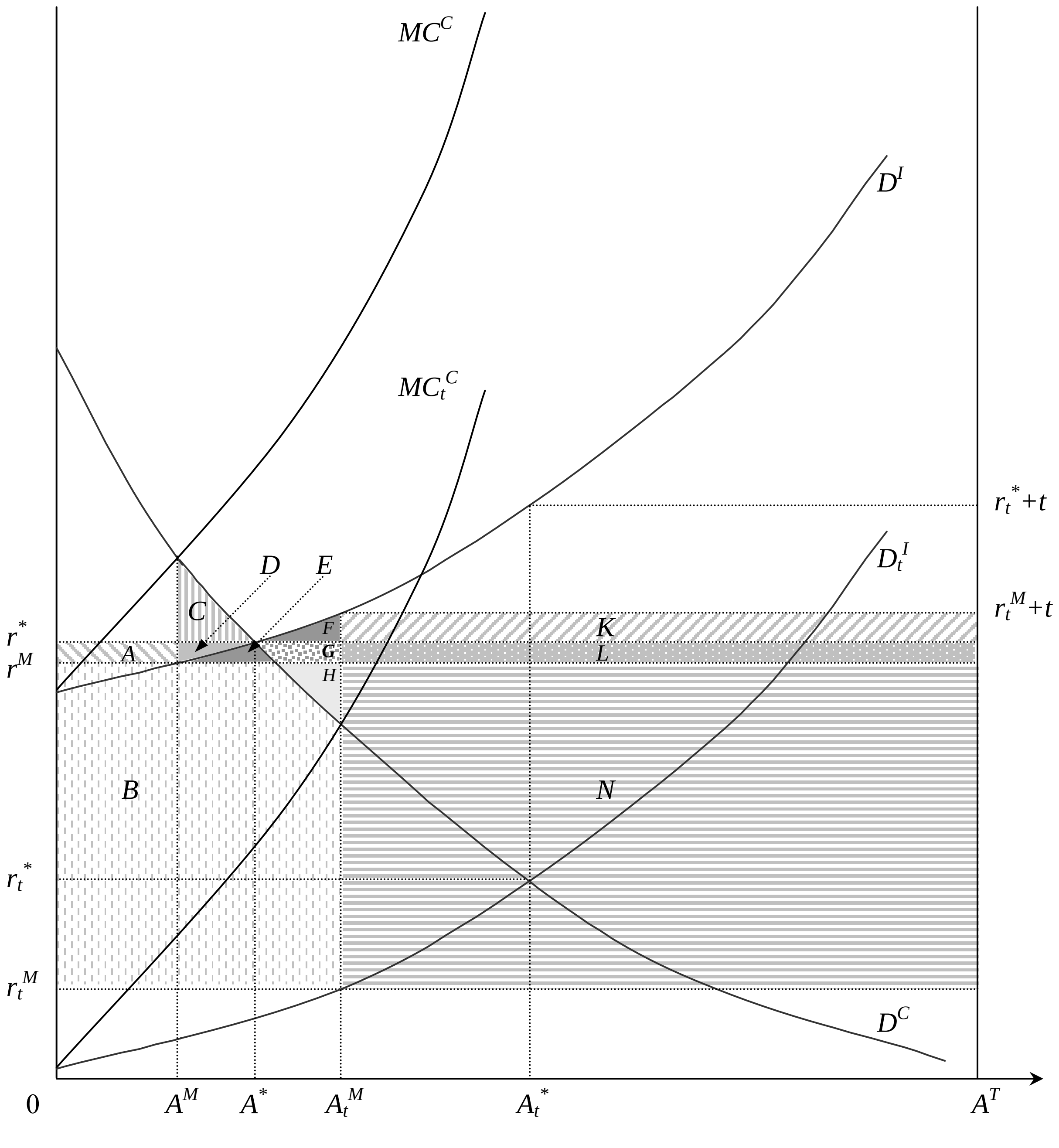


Figure 2.1. Effect of subsidies without imperfect competition and transaction costs in the land market

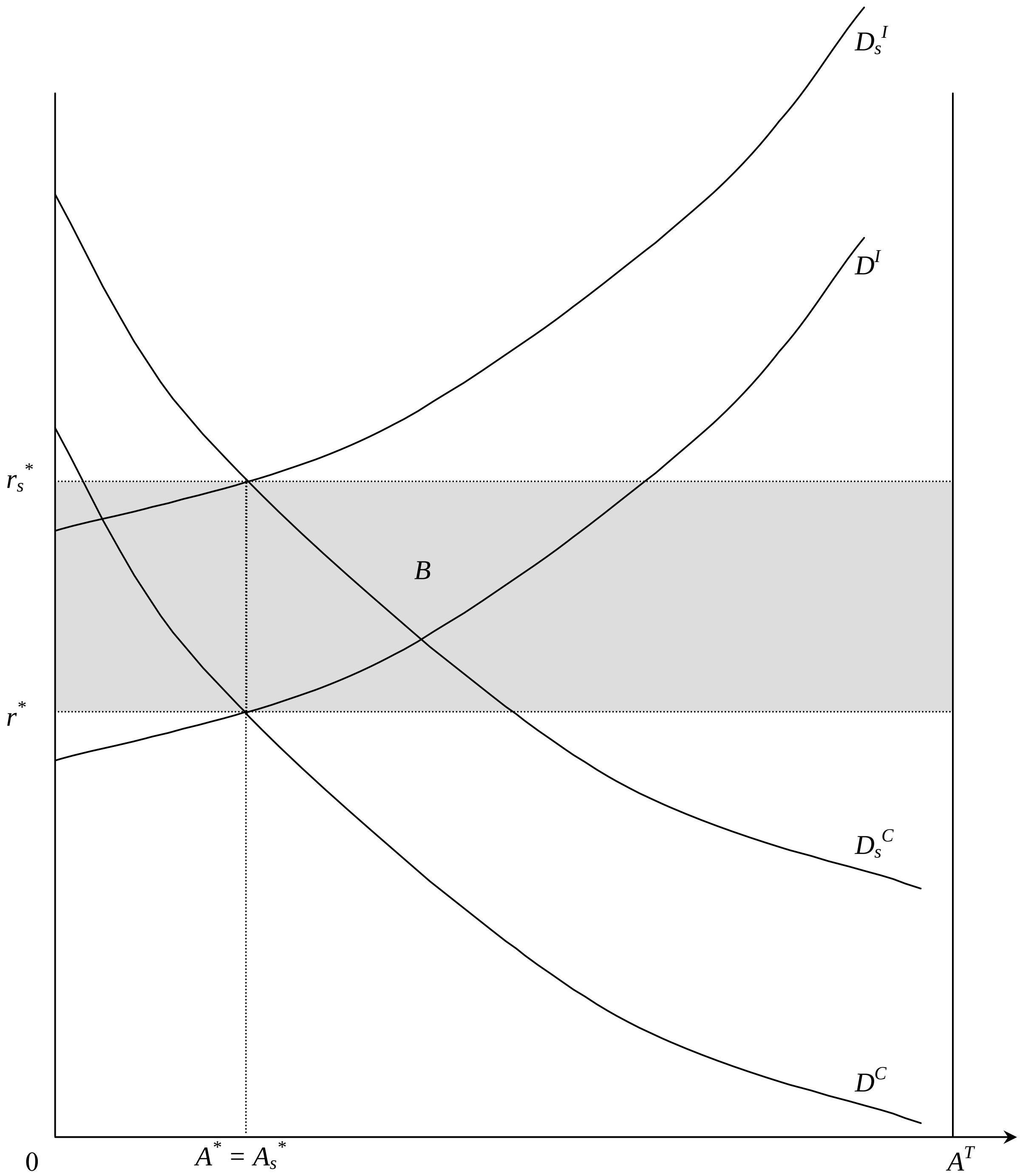


Figure 2.2. Effect of subsidies with imperfect competition and transaction costs in the land market

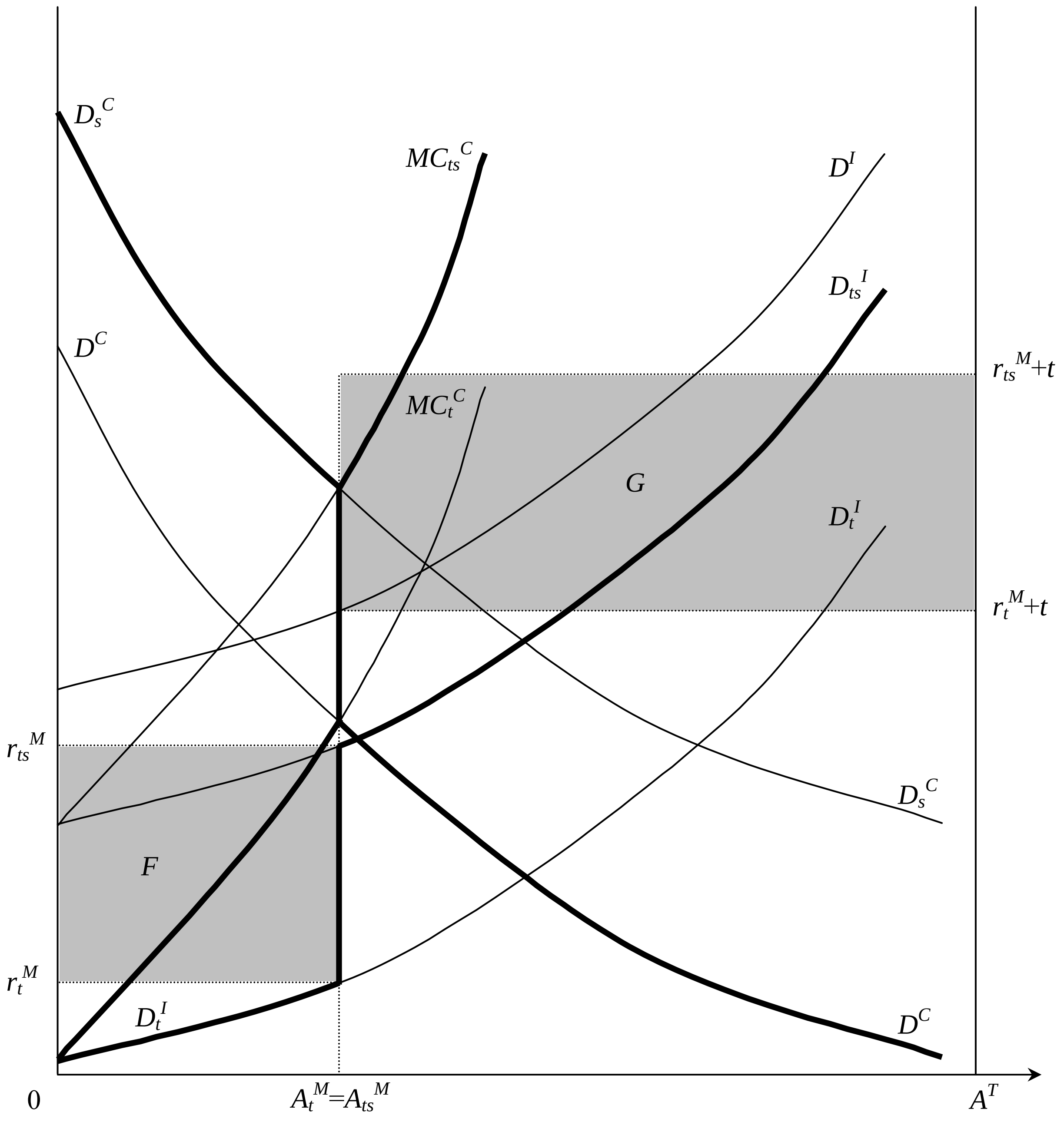


Figure 2.3. Effect of unequal subsidies (without imperfect competition and transaction costs) in the land market

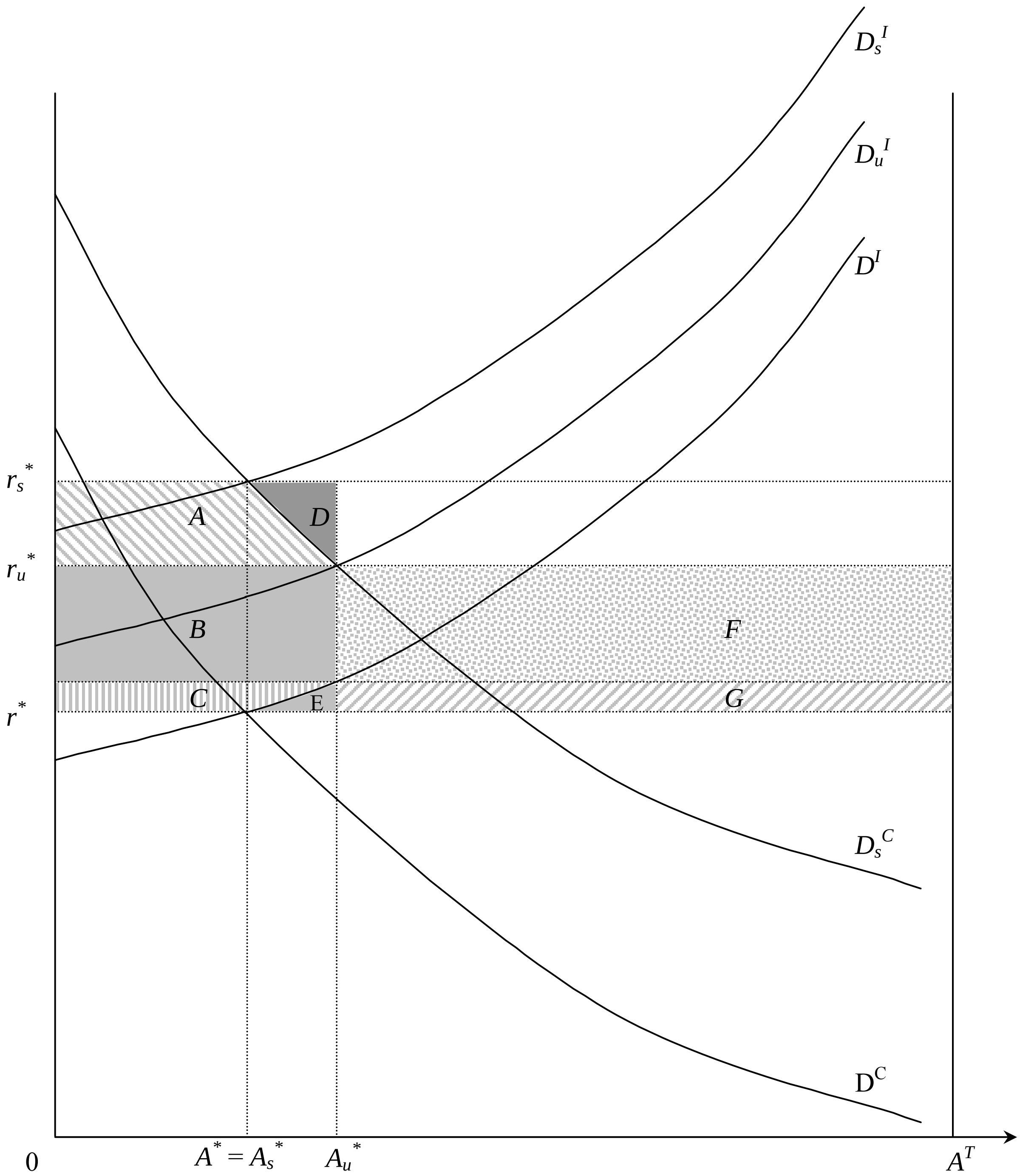


Figure 2.4. Effect of unequal subsidies with imperfect competition and transaction costs in the land market

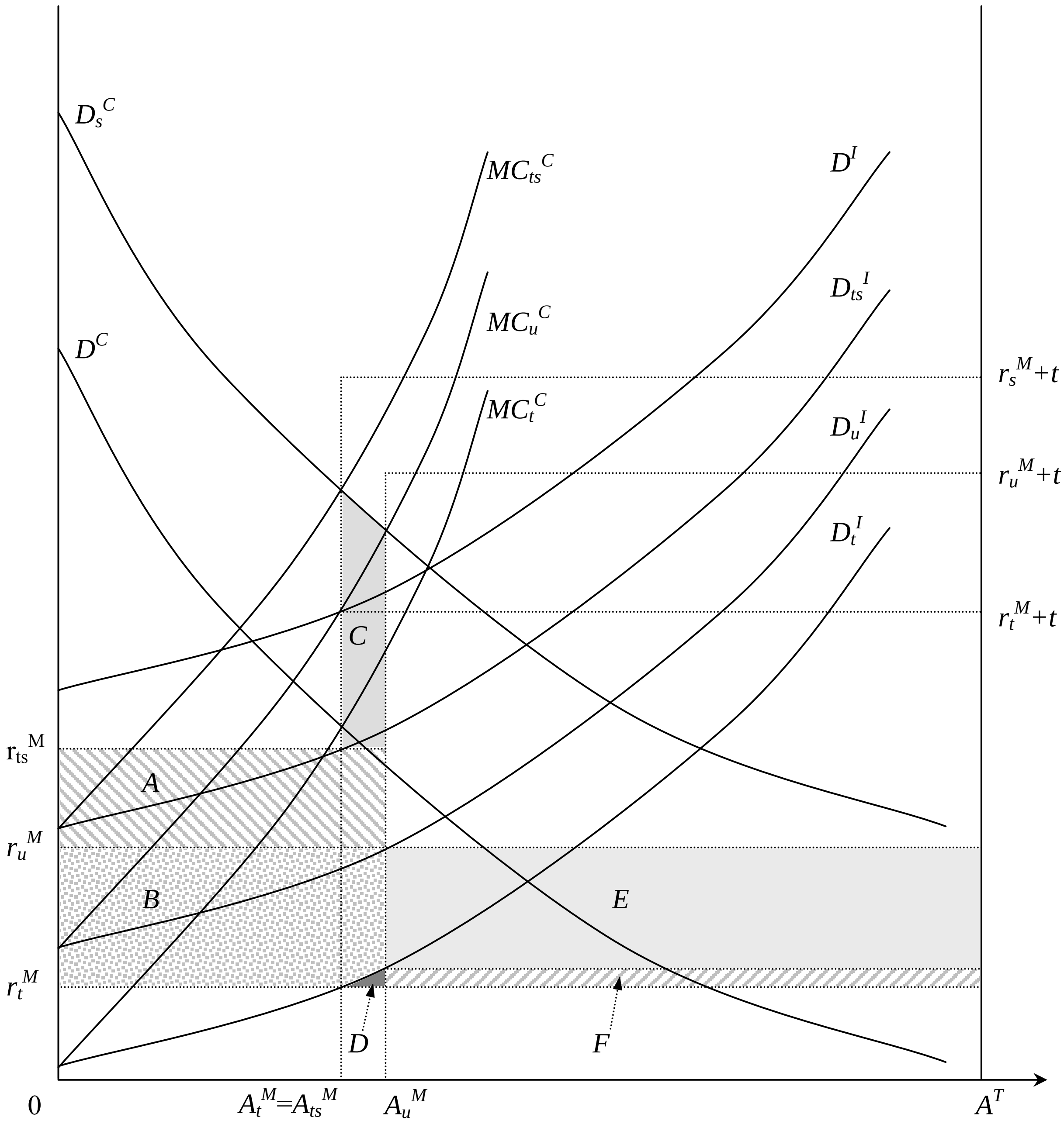


Figure 2.5. Effect of area payments and SFP on restructuring

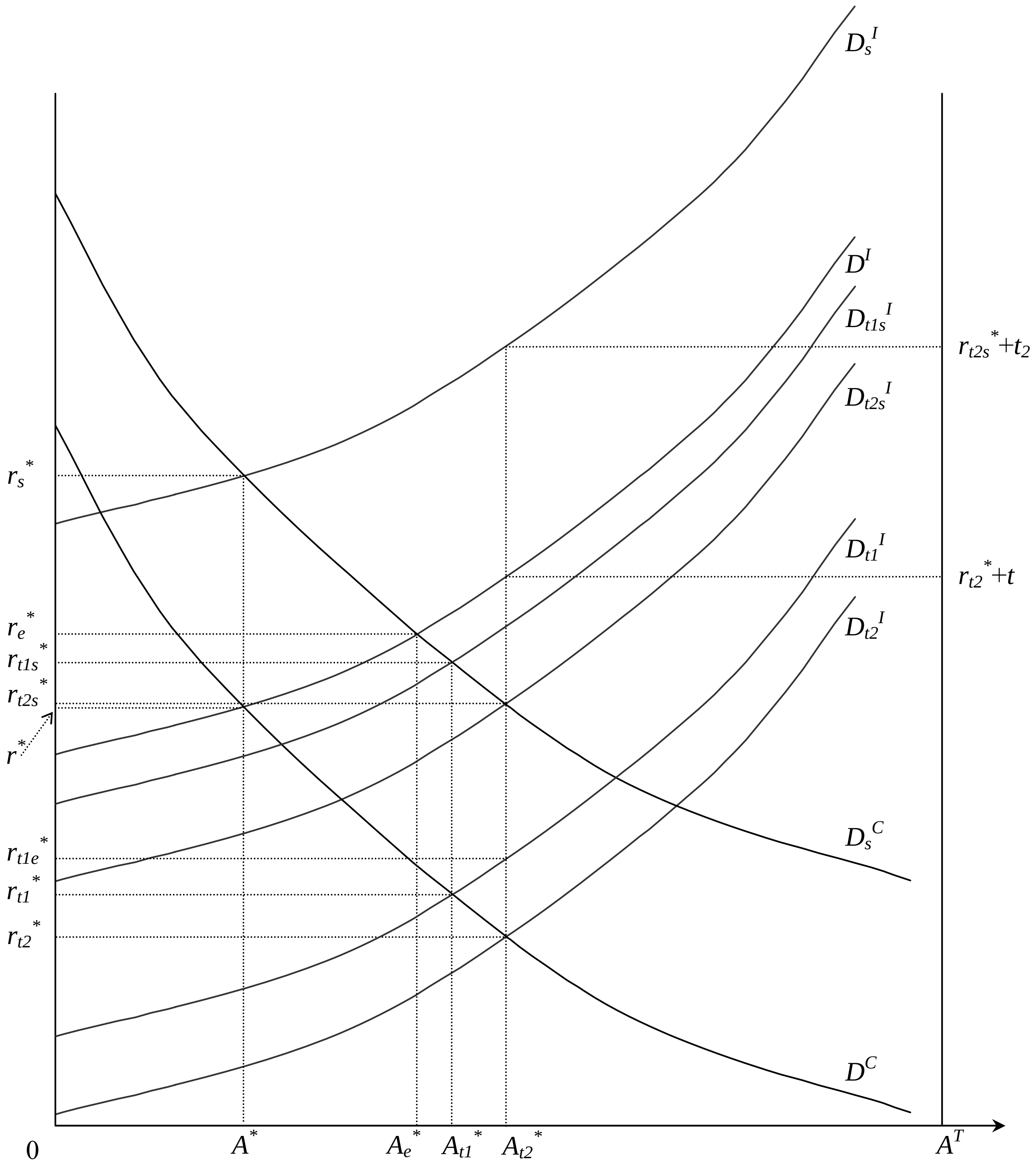


Figure 3.1. Equilibria in the land market with credit constraint

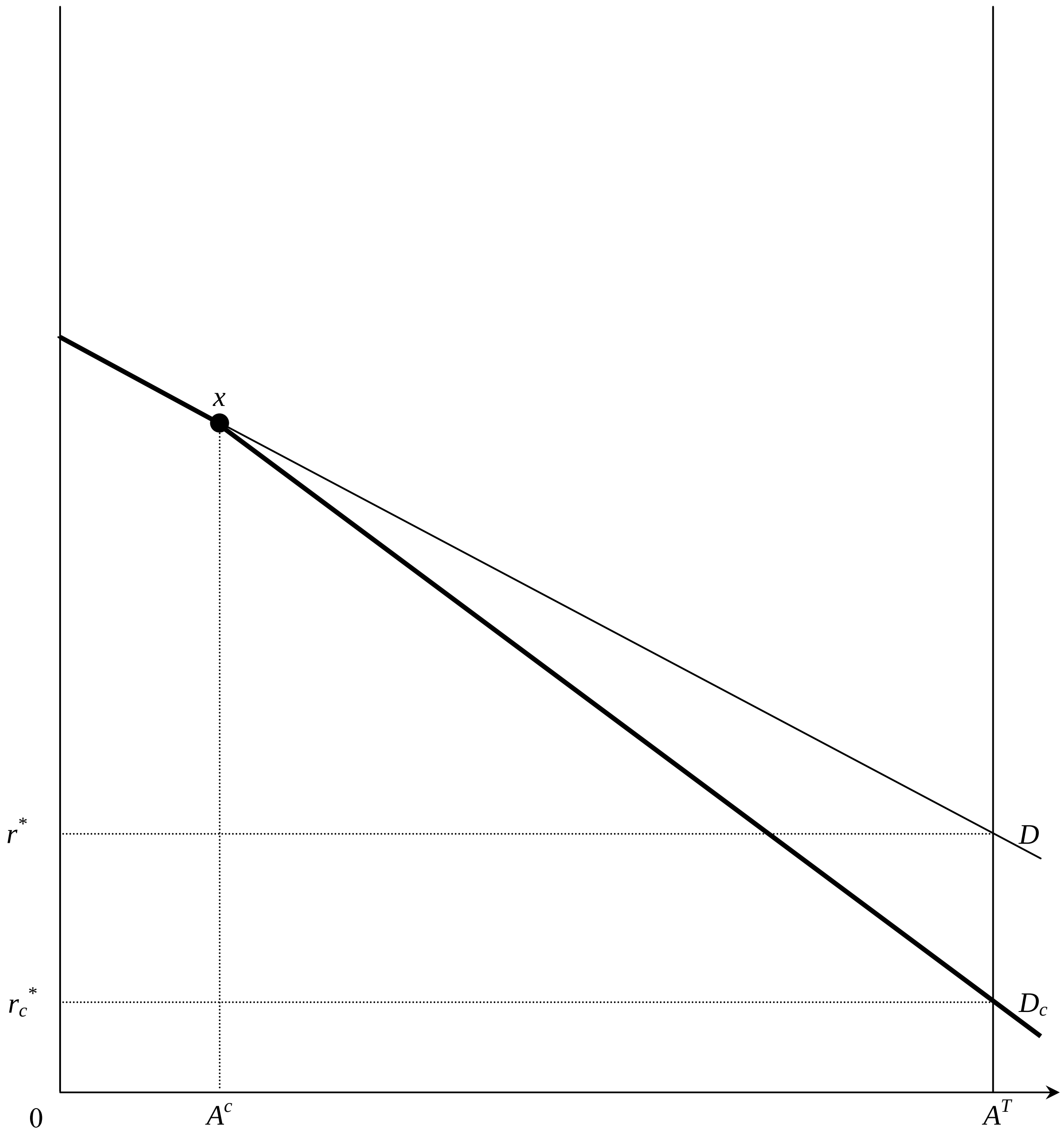


Figure 3.2. Equilibria in the land market with credit constraint and with area payments

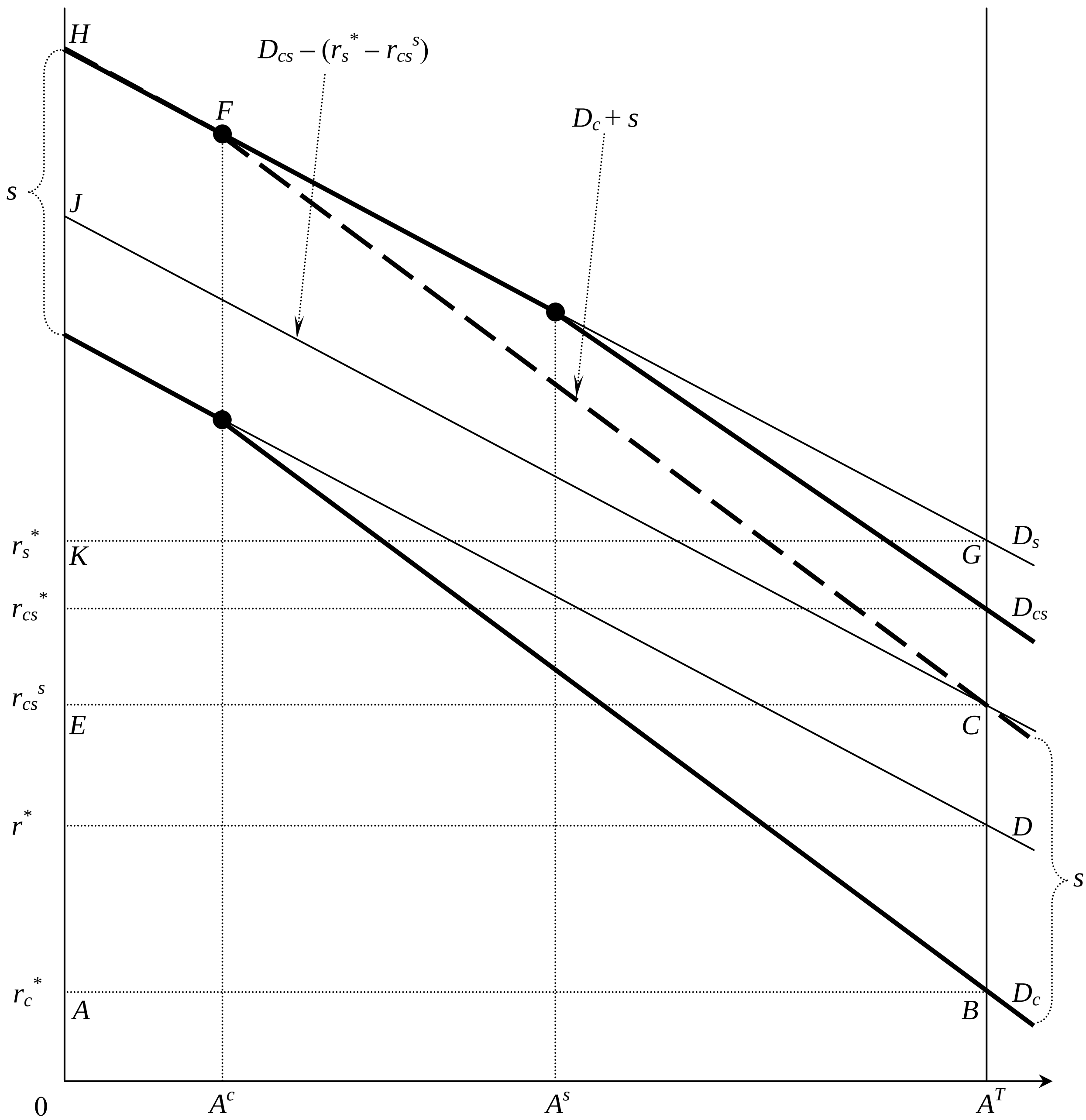


Figure 3.3. Equilibria in the land market with credit constraints, with area payments, and with heterogeneous farms

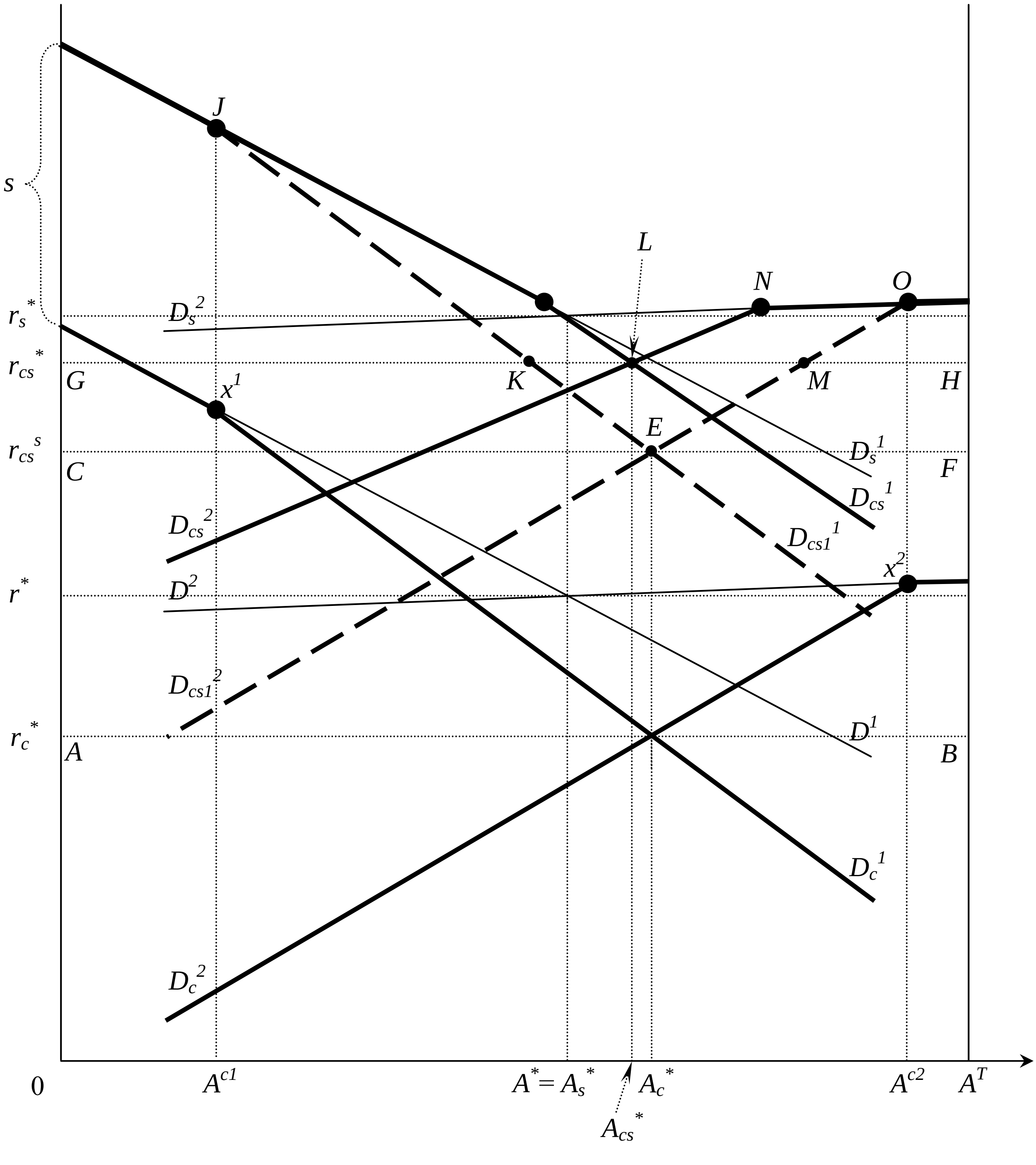


Figure 3.4. Equilibria in the land market with farm 1 credit constraint and with area payments

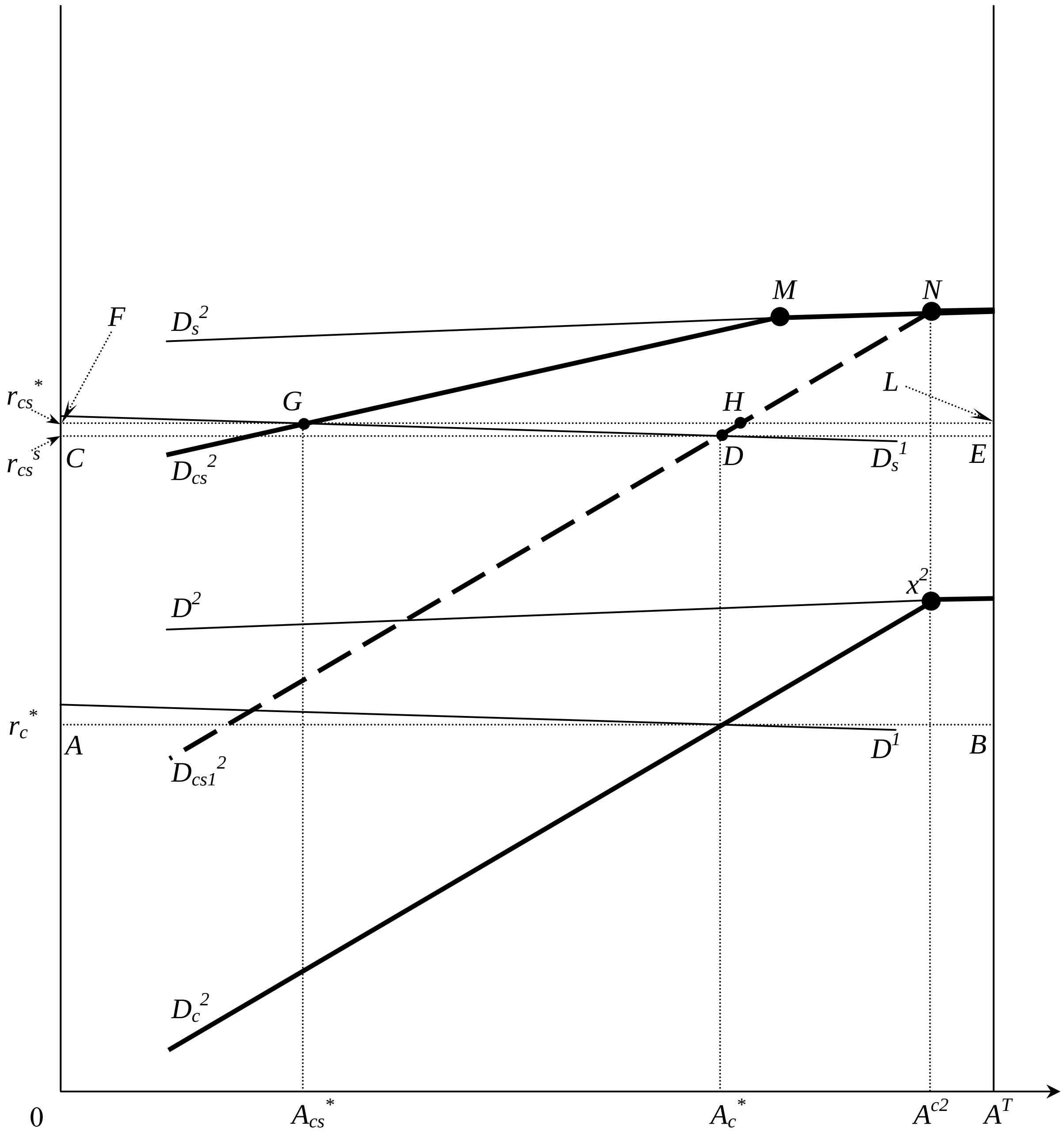


Figure 4.1. Effect of transaction costs t* and imperfect competition in the land market

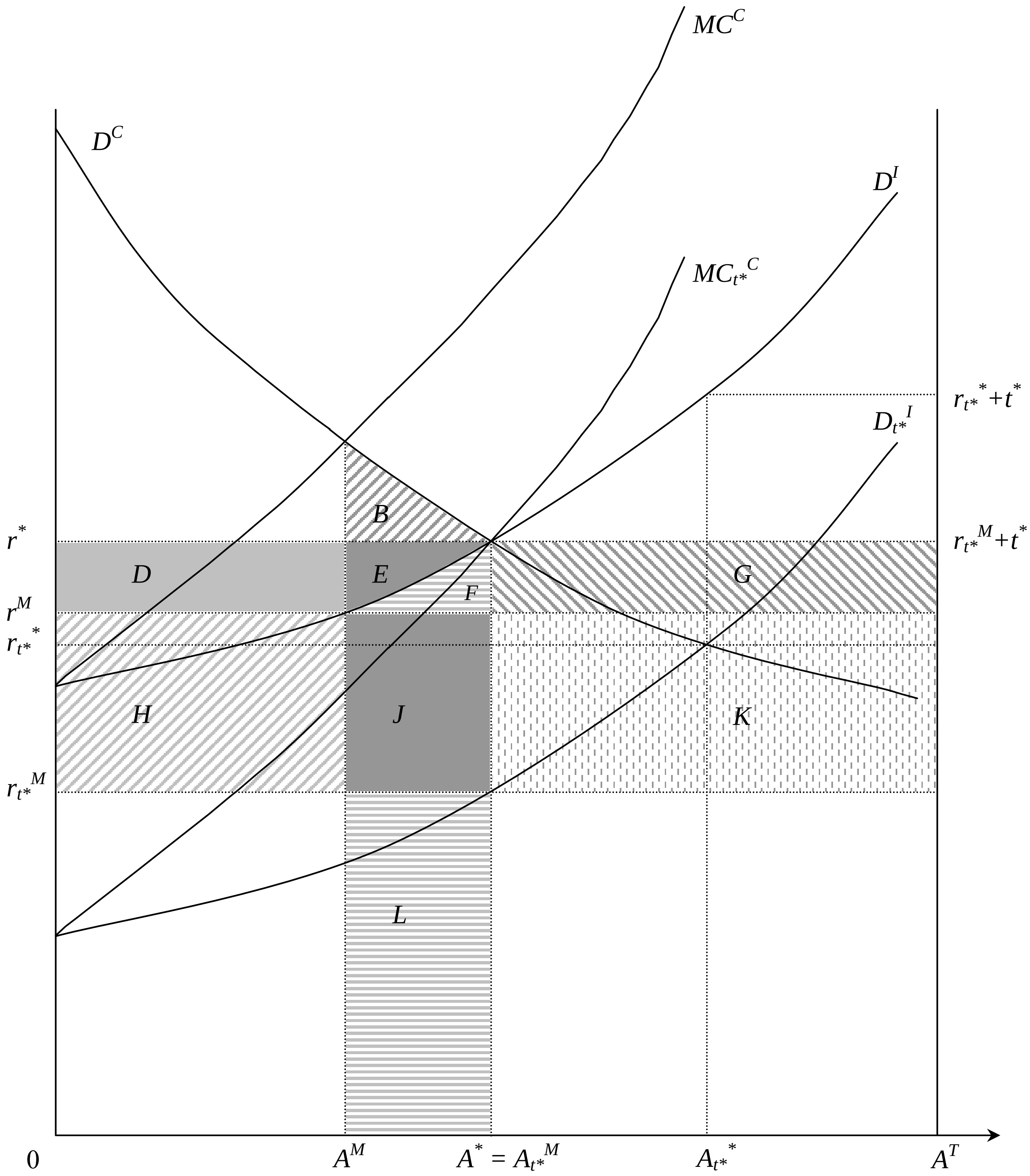


Figure 4.2. Effect of reform on welfare and incomes

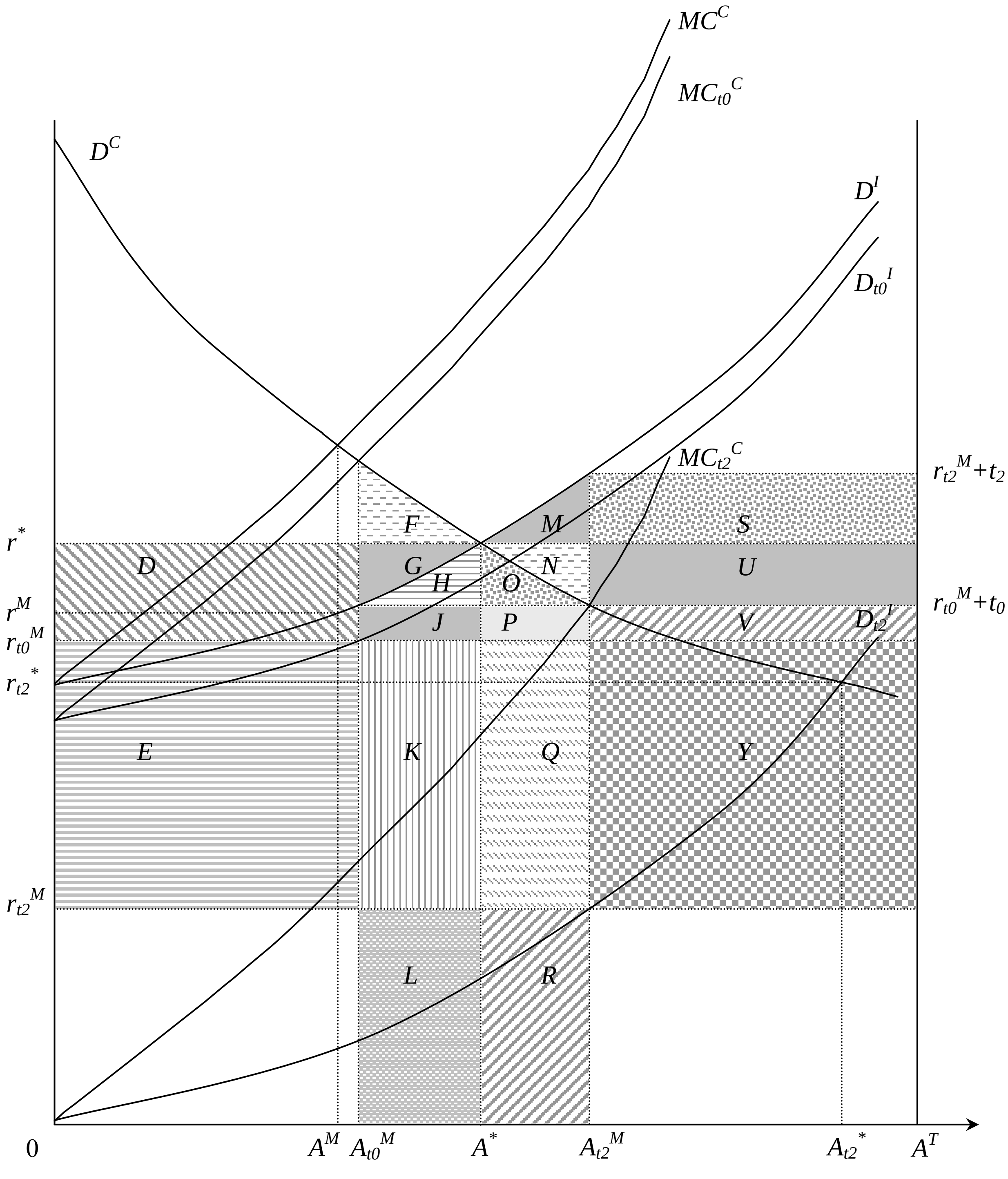


Figure 4.3. Effect of transaction costs reduction on output and welfare with imperfect competition in the land market

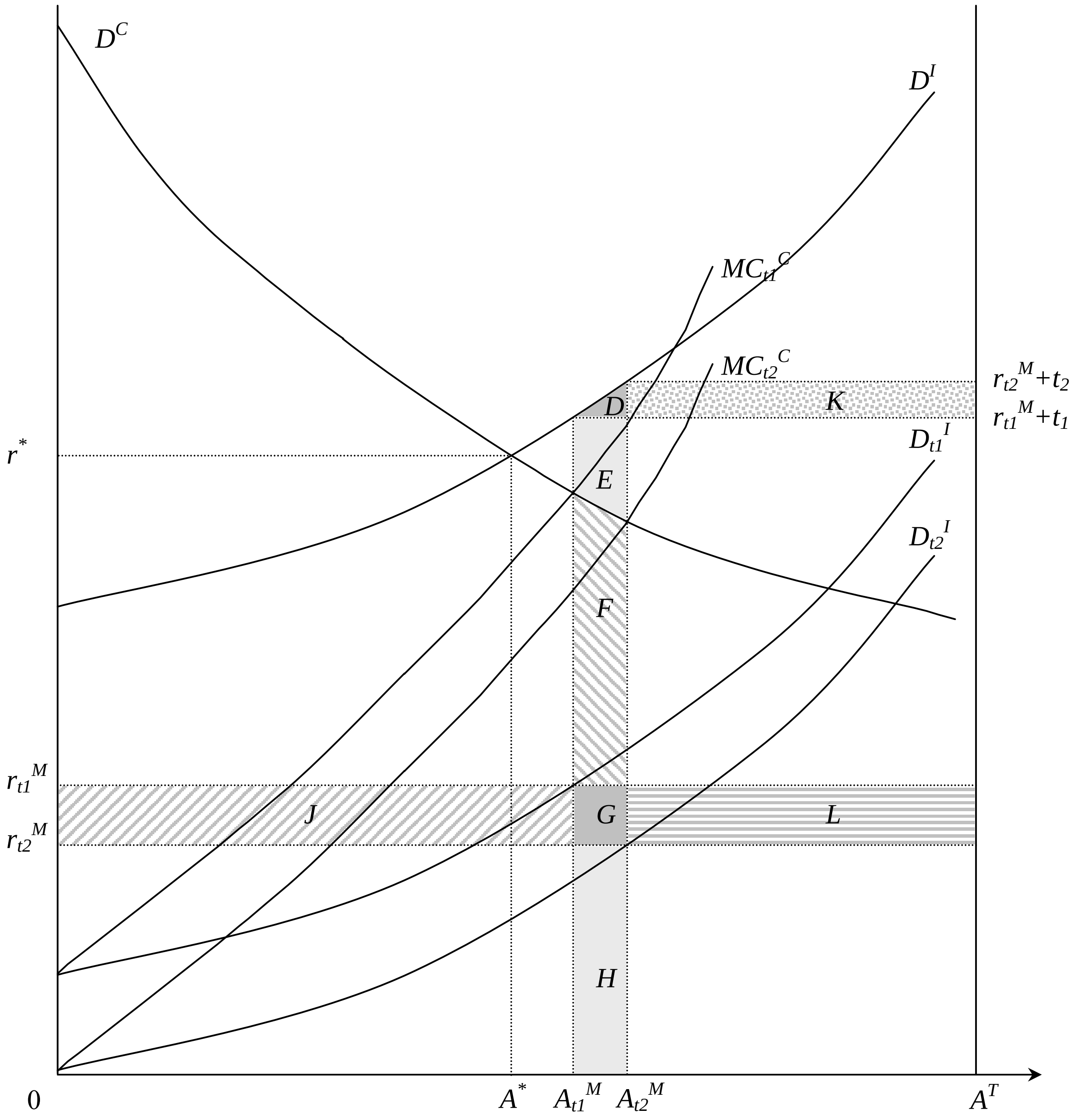


Figure 4.4. Effect of transaction costs reduction on output and welfare with imperfect competition in the land market

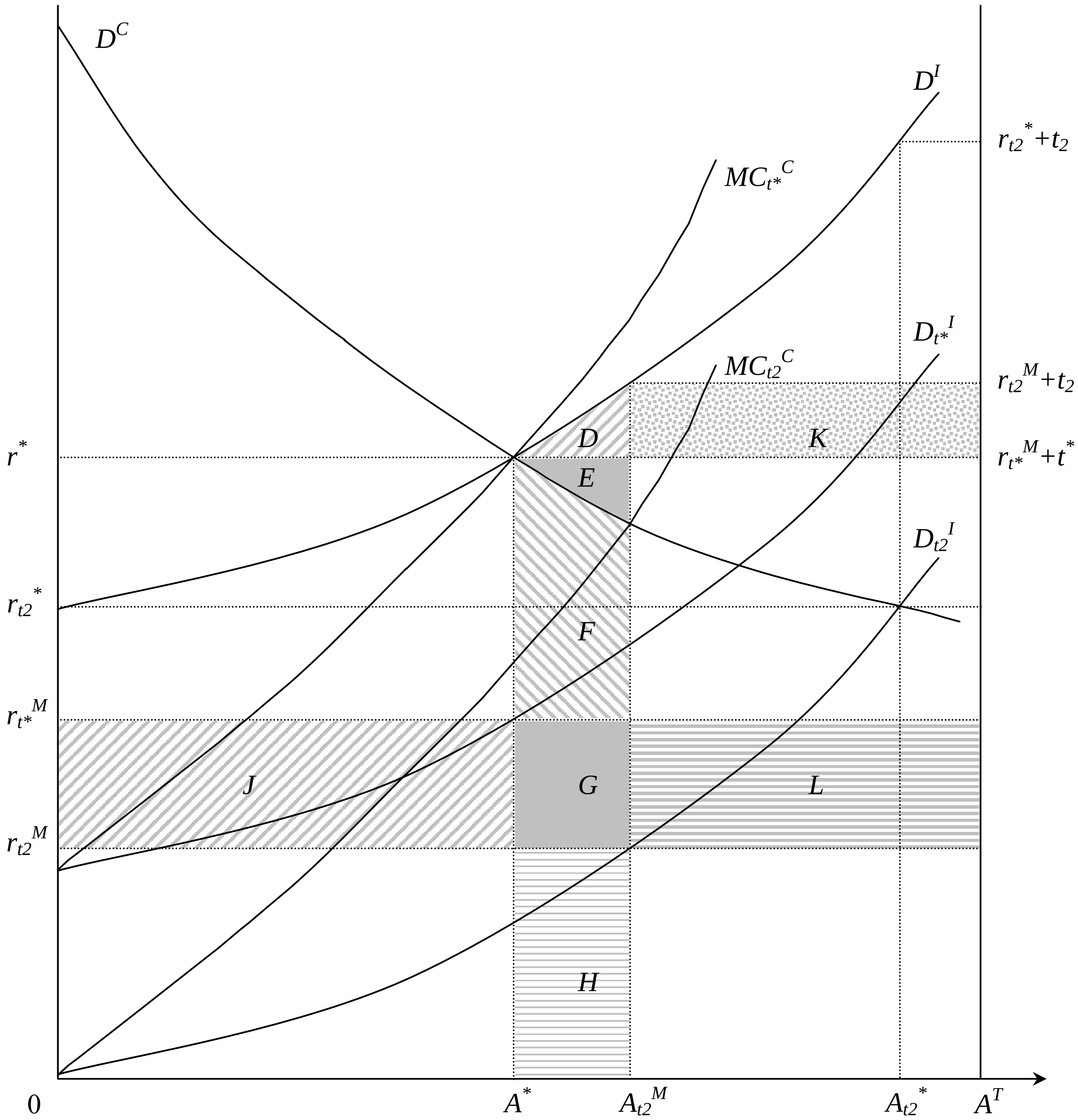


Figure 4.5. Effect of transaction costs elimination on output and welfare with imperfect competition in the land market

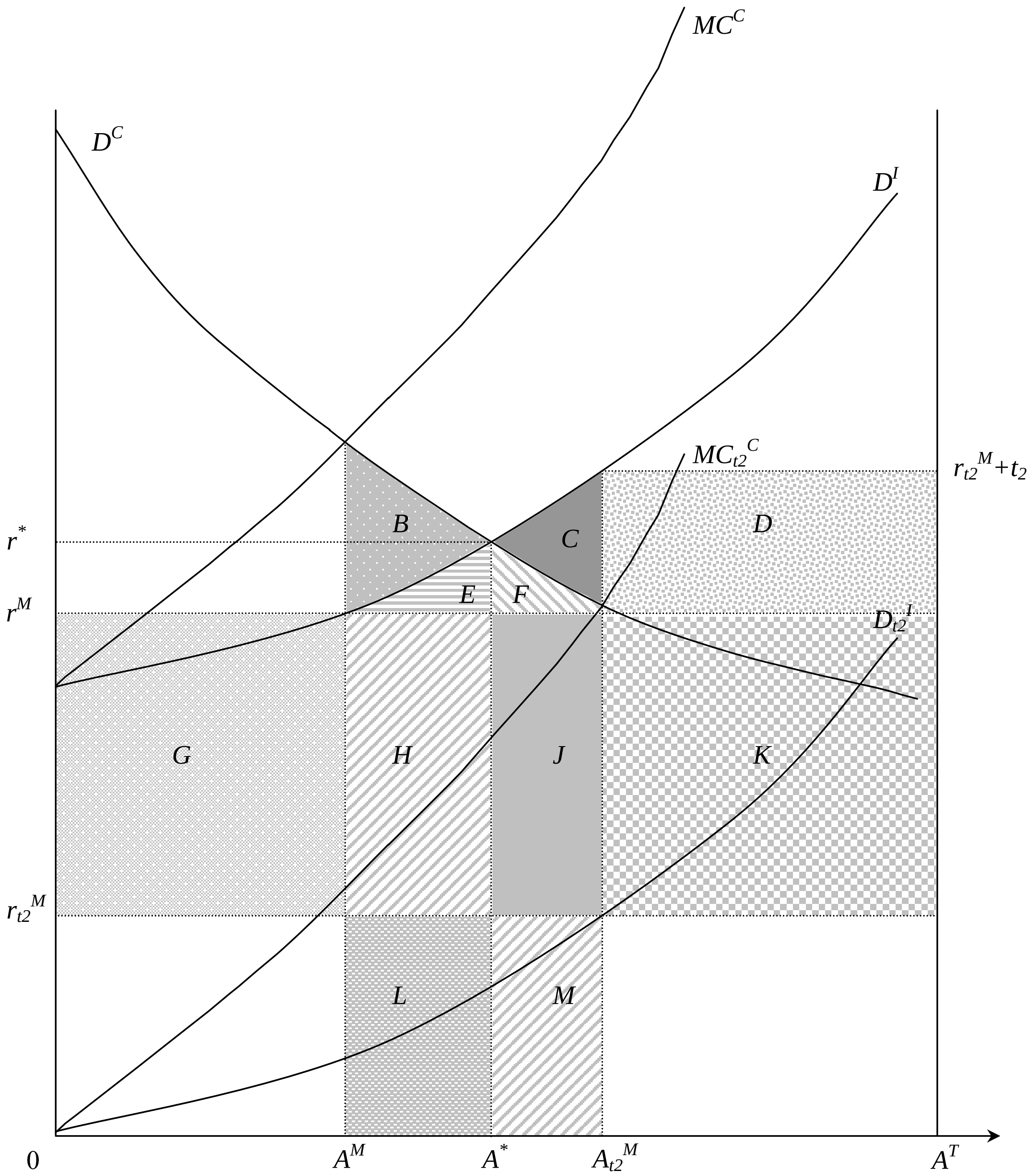


Figure 4.6. The effect of land demand elasticities on output loss (shown in % change of total output) induced by the reduction of initial transaction costs t^* to zero

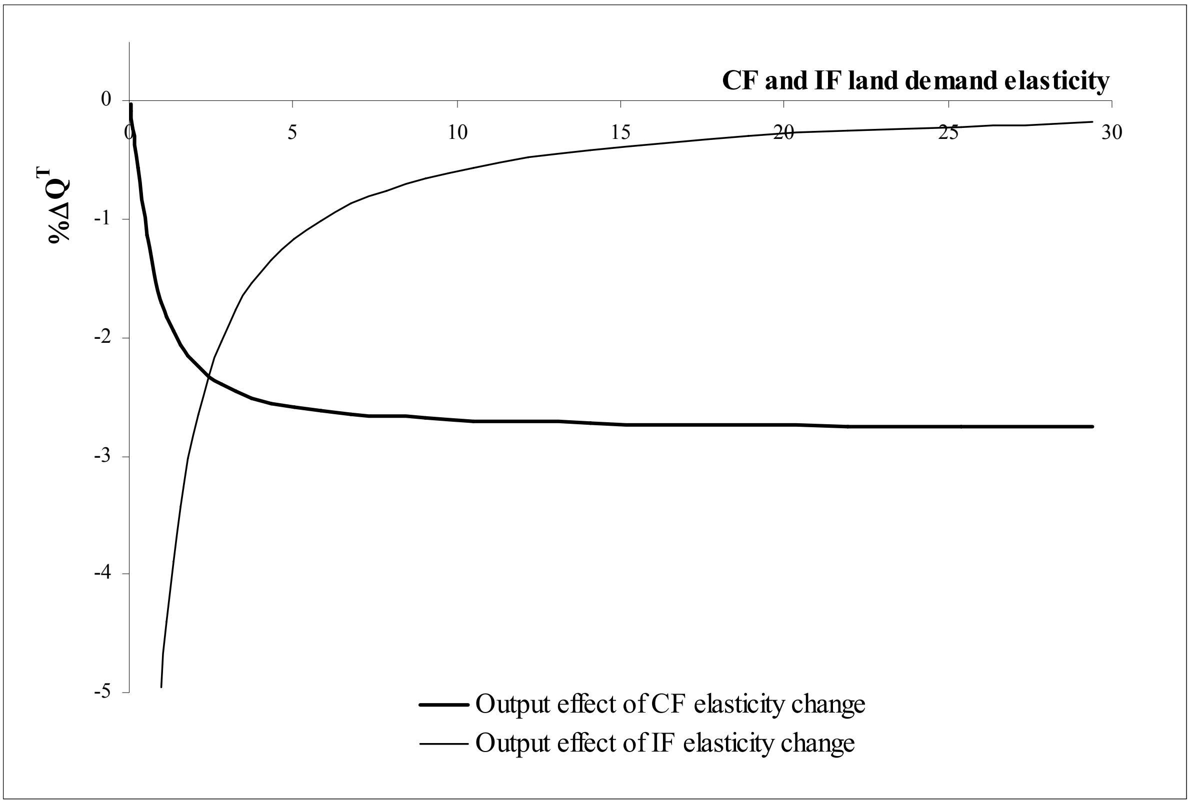


Figure 4.7. The effect of land demand elasticities on output gain (shown in % change of total output) induced by the reduction of initial transaction costs to t^*

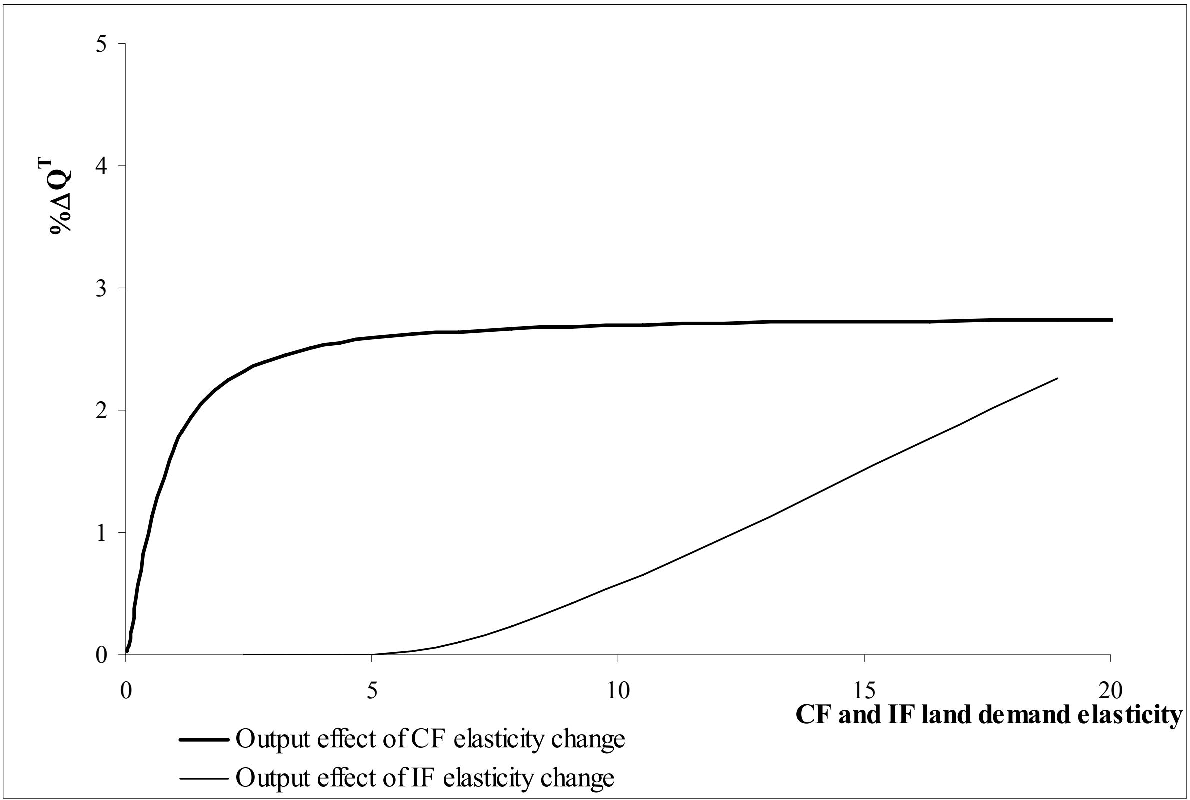


Figure 4.8. Relative farm productivity and total welfare effects of transaction costs elimination with imperfect competition in the land market

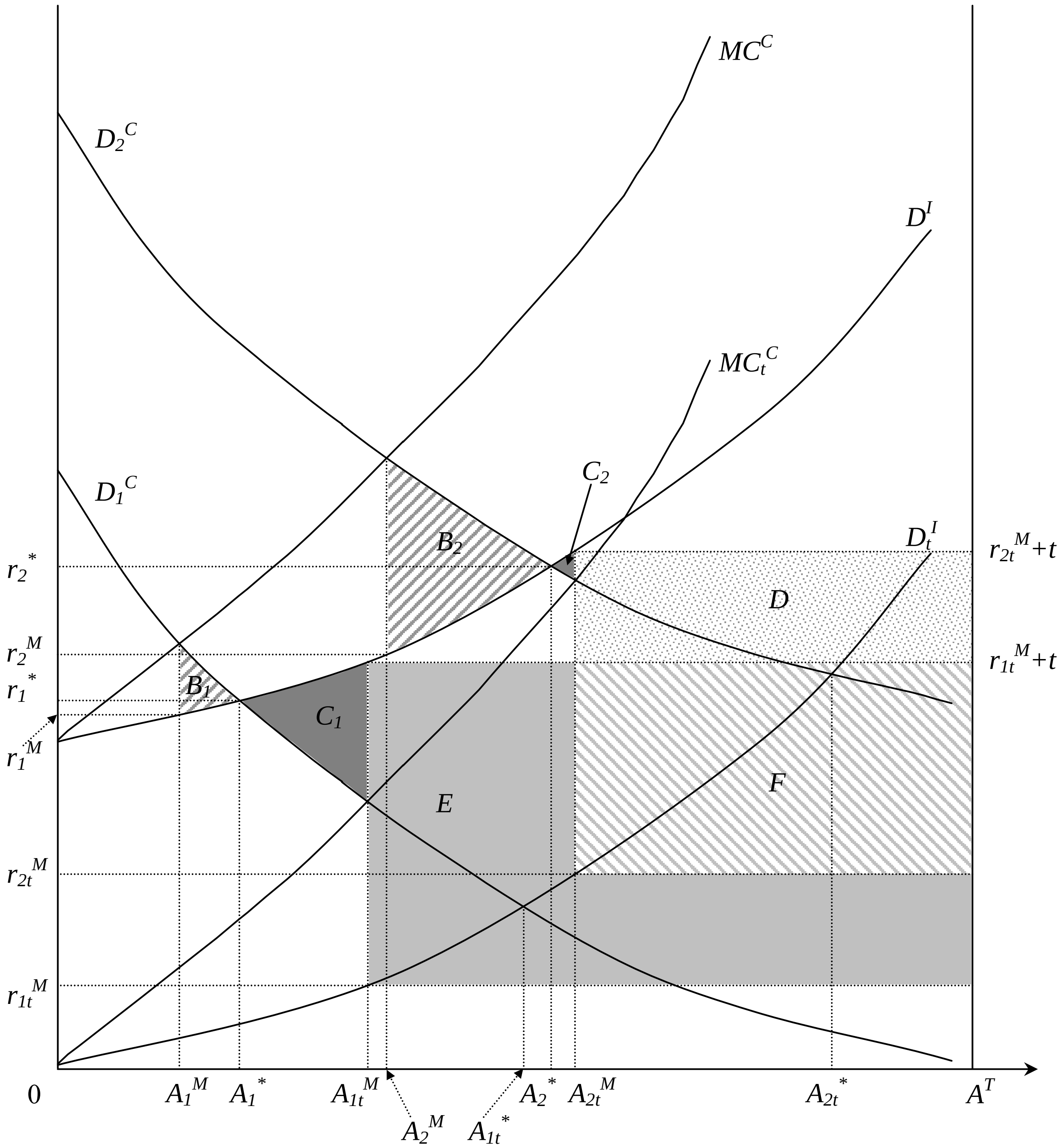
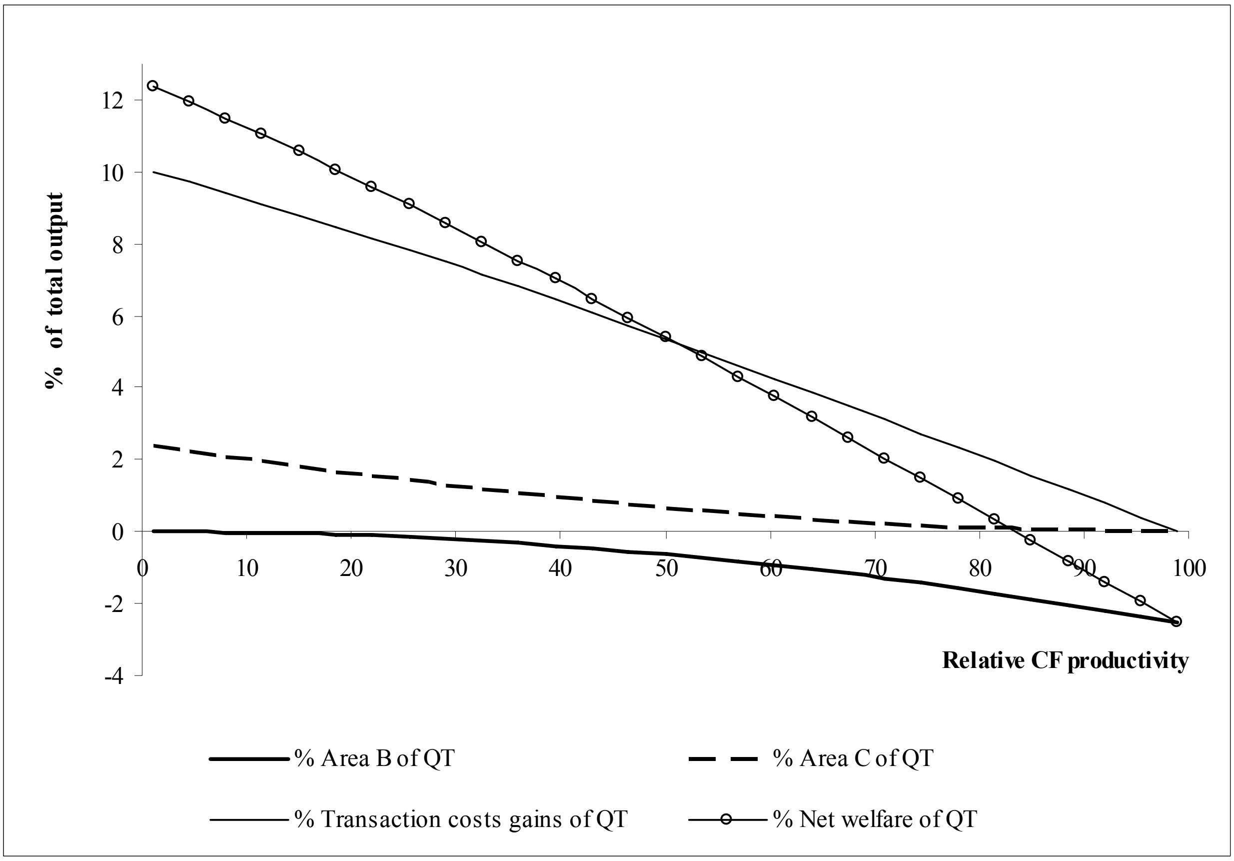


Figure 4.9. Relative farm productivity and the effect of the removal of transaction costs on output, transaction costs gains, and welfare



Note:
Q^T – total output

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